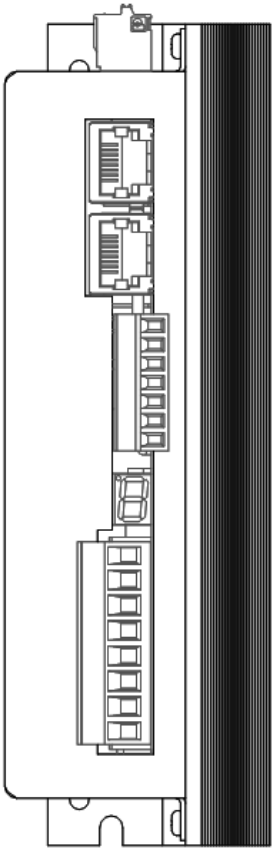
SW1D_____

Manual for Installation, Use and Maintenance



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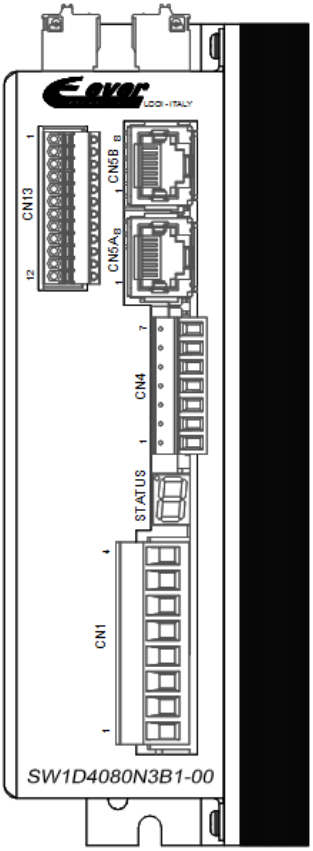

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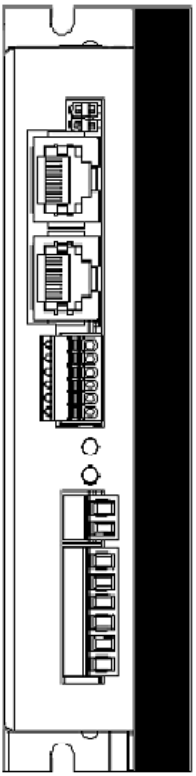

SW1D2142__61-x0
SW1D3142__61-10

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EVER Elettronica
Via del Commercio 2/4, Loc. San Grato Z.I.
26900 – LODI – ITALY
Phone: ++39(0)371412318 Fax: ++39(0)371412367
e-mail : infoever@everelettronica.it
URL : www.everelettronica.it

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1.1	Sonzogni	HD	Update of RMA procedure	12/09/2012
1.2	Sonzogni	HD	Update	04/02/2013
1.3	Sonzogni	HD	Update	22/02/2013
1.4	Sonzogni	HD	Review of power supply range	13/06/2013
1.5	Sonzogni	HD	Review of operating range	11/07/2013
1.6	Sonzogni	HD	Update of new versions	16/07/2013
1.7	Sonzogni	HD	Correction of CN5A pinout (no RS232)	26/03/2014
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INDICE

1 INTRODUCTION....4
1.1 Guarantee....4
1.2 In this manual....4
1.3 System components....5
1.4 General description of the drive....7

2 SPECIFICATIONS....8
2.1 Mechanical and environmental....8
2.1.1 Dimensions SW1D4080__61-00....9
2.1.2 Dimensions SW1D4080__B1-00....10
2.1.3 Dimensions SW1Dx142....11
2.2 Electronics....12
2.2.1 Power supply....12
2.2.2 Hi-freq digital inputs....15
2.2.2.1 Connection of an incremental encoder....19
2.2.3 Std Digital Inputs....20
2.2.4 Hi-Freq Digital Outputs....22
2.2.5 Std Digital Outputs....23
2.2.6 Analog inputs....24
2.2.7 Serial interface RS232/RS485....26
2.2.8 CanBus Interface....28
2.3 Standards....31

3 INSTALLATION OF THE DRIVE....32
3.1 Safe installation and use of the unit....34
3.2 Power supply of the system....36
3.3 Choosing the stepper motor....42
3.4 Assembling of the drive....42
3.5 Drive connections....44
3.5.1 Connectors, Dip-Switches, Jumpers, Display of SW1D4080....45
3.5.1.1 Pin connectors SW1D4080....46
3.5.1.2 mating connectors SW1D4080....49
3.5.1.3 Cables section SW1D4080....49
3.5.2 Connectors, Dip-Switches, Jumpers, LEDs on SW1Dx142....50
3.5.2.1 Pin connectors SW1Dx142....51
3.5.2.2 mating connectors SW1Dx142....53
3.5.2.3 Cables section SW1Dx142....53
3.5.3 Guideline for wiring....54
3.6 User configurations....55
3.6.1 Dip-Switches....55
3.6.2 Jumpers....55
3.6.2.1 Opening the cover to modify jumpers....56
3.7 First start up procedure....57
3.8 Operational statuses and their signals....57
3.8.1 Operational statuses and signals of SW1D4080....57
3.8.2 Operational statuses and signals SW1Dx142....59
3.9 Analysis of not reported malfunctions....60

4 SW1D____ Versions....61

APPENDICES.....64
A.1 Manuals and applicable documentation.....64
A.2 FIRMWARE AND APPLICABLE NOTES.....65
A.2.1 MODBUS® and CANbus Slave.....66
A.2.2 eePLC®.....68
A.3 Cables and adapters.....70
A.3.1 Cable RS232 point-to-point SW1-Controller.....70
A.3.2 Cable RS485 Full-Duplex point-to-point SW1-Controller.....70
A.3.3 Cable RS485 Half-Duplex point-to-point SW1-Controller.....71
A.3.4 Cable CANbus point-to-point SW1-Controller.....71
A.3.5 Adapter RS232 SW1-Controller.....72
A.3.6 Adapter RS485 SW1-Controller.....72
A.3.7 Adapter CANbus SW1-Controller.....73

1 INTRODUCTION

In this section are presented the main characteristics of the SW1D____ drives, as part of an integral step motor system.

The available drive versions are described in chapter ***4 SW1D____ Versions***.

1.1 Guarantee

Ever Elettronica guarantee that their motors and drives supplied to the client (end user, machine builder or distributor), are free of defects caused by materials, shipment operations and packaging and to meet the guarantee in accordance with the client's specifications who has accepted the written terms defined by Ever.

The product guarantee is valid for the duration of one (1) year from the date of construction, which is indicated by the code on the label present on the system.
During the guarantee period of the product, Ever is in no case responsible for damages to the product caused by improper storage or installation, negligent maintenance or unauthorized modifications or repairs to the product.

The responsibility of EVER is limited to the reparation (or replacement at their insight) of any manufactured product, or part of it, which is defect due to defect materials or a manufacturing defect, in accordance with the guarantee conditions of EVER.

The content of this manual is updated until the date of printing. With the continuous development and introduction of product improvements, EVER have the right to change the technical specifications of their products and to alter the content of this manual without the obligation to announce it.

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1.2 In this manual

The used symbols in this manuals have the following meaning:

Danger
Warning
Caution

Used for circumstances in which the life or health of the user are exposed to danger or where in serious damage to materials may occur.

Attention! ***Special instructions*** *for a safe use and an effective installation.*

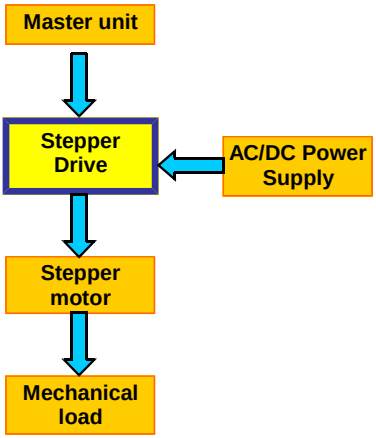
Information *Used to stress* ***important additional information.***

EMC *An essential element to stay within the limits specified by the* ***EMC*** *directions is, in addition to the use of filters, the installation in accordance with the EMC requirements.*

1.3 System components

Components which need to be provided for a complete installation of the drive.

Block diagram



Design phases of a handling system:

1. Define the requirements of the application (loaded torque, RPM, positioning precision, acceleration and velocity, etc.);
2. Select the motor adapted to satisfy the characteristics of the previous point.
3. Define the drive characteristics:
    a. Electrical performances of the motor;
    b. Motion control commands (Step / direction, serial communication, etc.);
    c. Additional features (I/O user, interface encoder, etc.);
4. Dimension the compatible power supply with the motion profile, the characteristics of the motor and the drive;
5. Define the dissipation characteristics;

Dimensioning

Contact our support department by the e-mail address support@everelettronica.it for the dimensioning of some parts of the motion system (motor, drive and power supply).

*Refer to the section **3.2 Power supply of the system** for information about the power supply.*

1.4 General description of the drive

The content of this manual can be applied in general to the drive SW1D____ .
The particularities of the different versions are described in chapter ***4 SW1D____ Versions*** *.*

The SW1D___ drives are designed to drive with the bipolar chopper technology 2 phase stepper motors. The motor may have 4, 6 or 8 wires.

Thanks to the voltage and current characteristics of the power stage, many types of stepper motors can be controlled, with winding current up to $8A_{rms}$ (11.28A)

The characteristics of the ***motor*** *have to be* ***compatible*** *with the output characteristics of the* ***drive.***

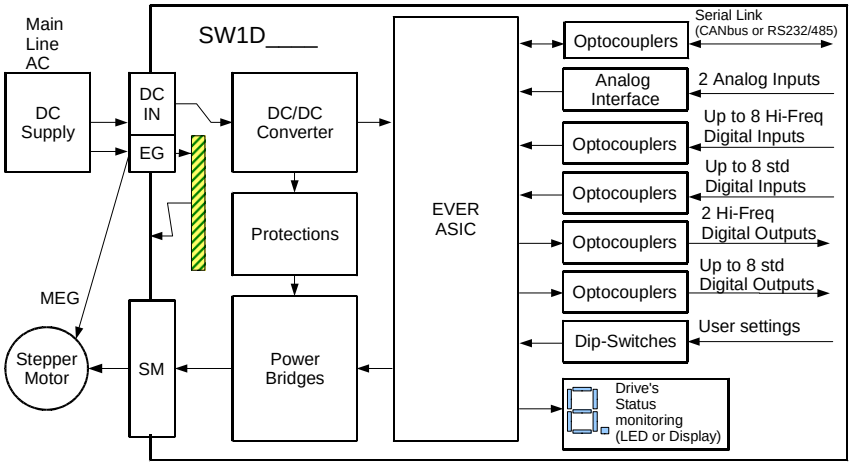
The drives of the series SW1D__ accept nominal DC power supply voltages from 24 to 140 Vdc and can be connected to the electric network by means of a transformer and a power supply.

The differences between the systems SW1D4080, SW1D3142 and SW1D2142 are described in the chapters 2 SPECIFICATIONS and 4 SW1D____ Versions .

The drive is suitable for:

- Micro-stepping for high resolutions and smooth movements;
- Sinusoidal winding currents to optimize the motor performances;
- Protection set and monitoring of the system status.
- Protections to protect the electronics against eventual damages such as:
  - over- and under- voltage;
  - overheating;
  - over current;
  - open motor phase;
- Possibility to generate operational ramps for the motor;
-

The diagram shows a SW1D____ system composed by the displayed functional blocks:



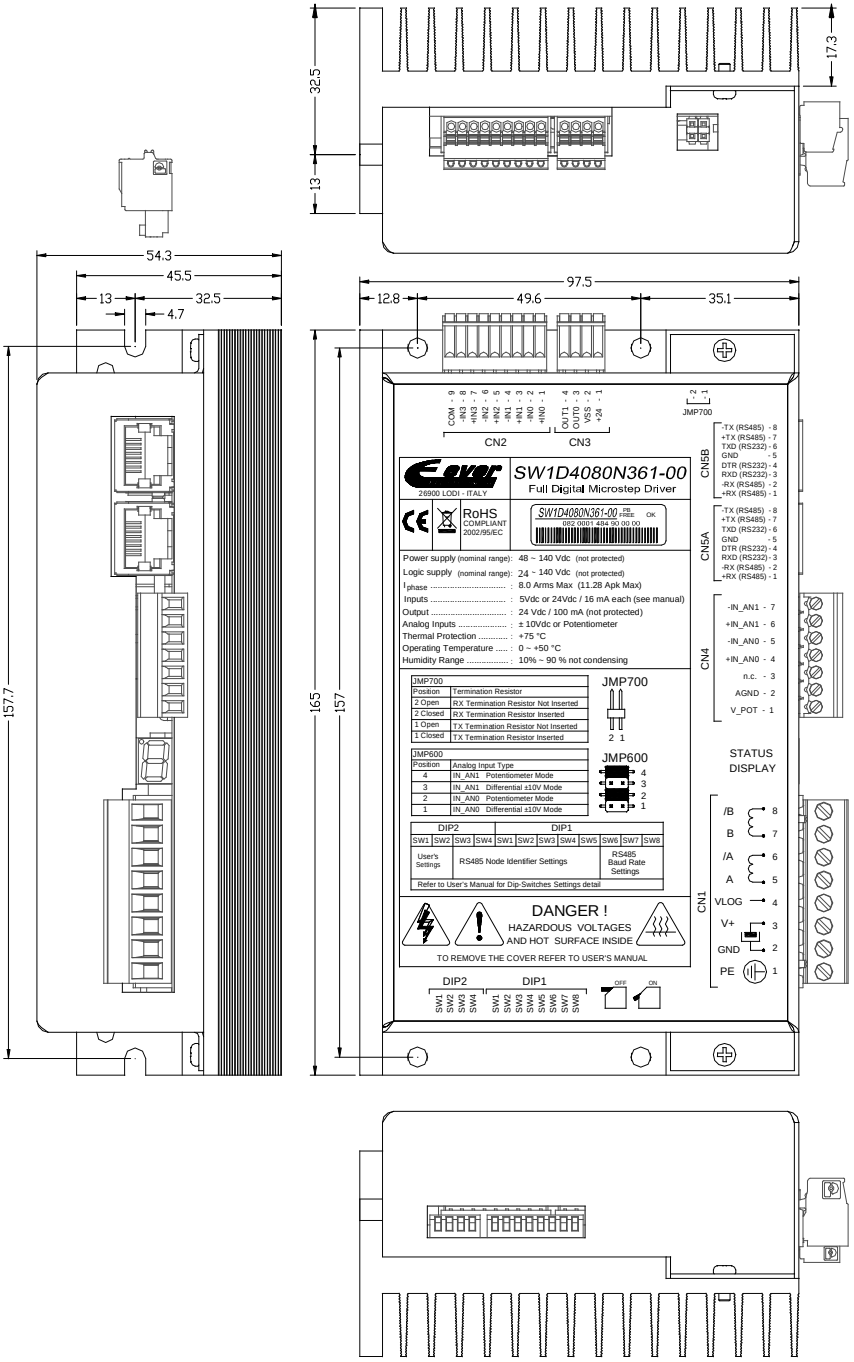
This manual contains the main information and the procedures for installation, start up and maintenance of the drive. Many functions of the drive depend on the drive version.

2 SPECIFICATIONS

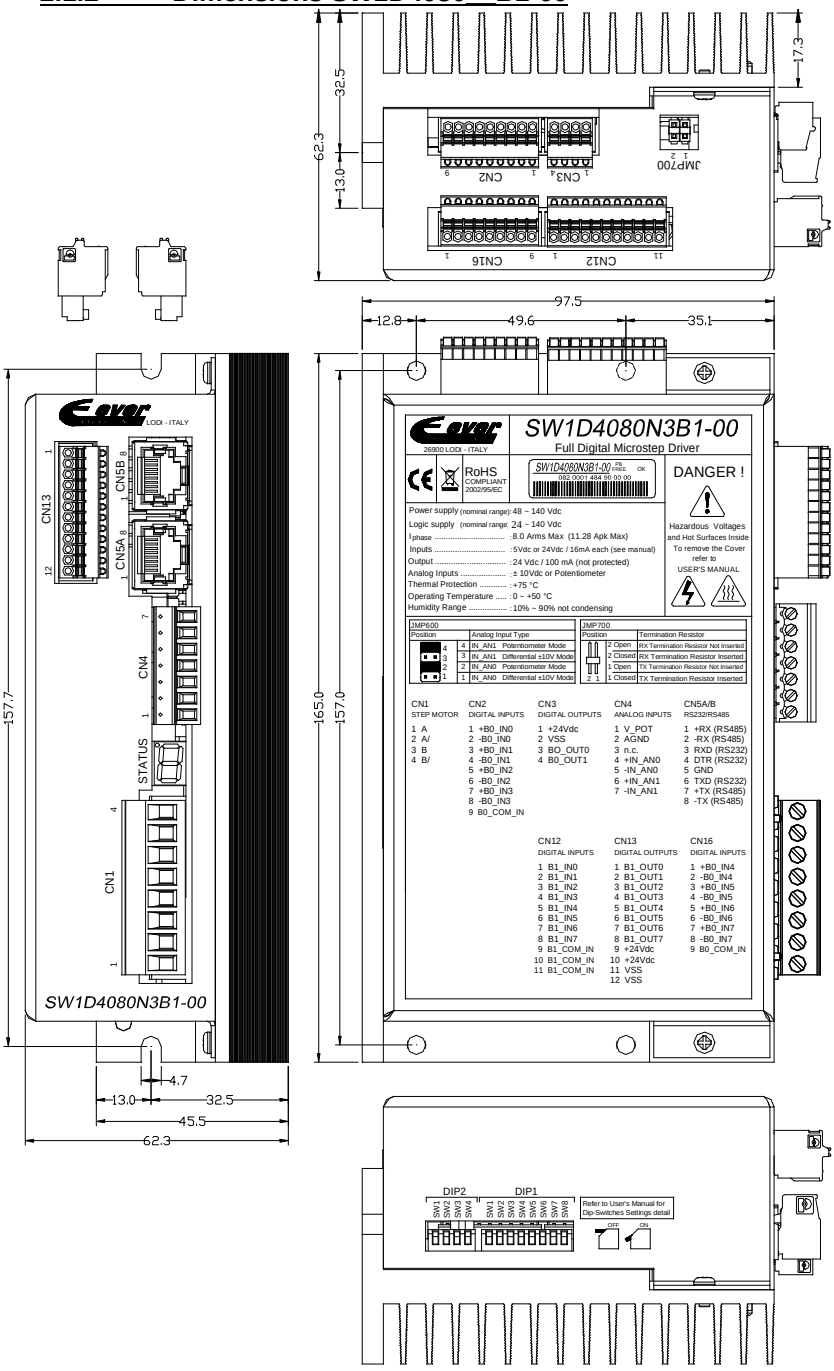
2.1 Mechanical and environmental

	SW1D4080__61-00	SW1D4080__B1-00	SW1Dx142	Unit	Note
Dimensions	165 x 97.5 x 54.3	165 x 97.5 x 62.3	142 x 74 x 37	mm	Excluding the footprint of the mating connectors. (For details check the following mechanical design).
Weight	680	750	500	gr	Excluding the mating connectors.
IP protection class	IP20	IP20	IP20		
Working temperature	5°C ÷ 40°C	5°C ÷ 40°C	5°C ÷ 40°C	°C	
Storage temperature	-25°C ÷ 55°C	-25°C ÷ 55°C	-25°C ÷ 55°C	°C	
Humidity	5% ÷ 85%	5% ÷ 85%	5% ÷ 85%	%	Without condensation

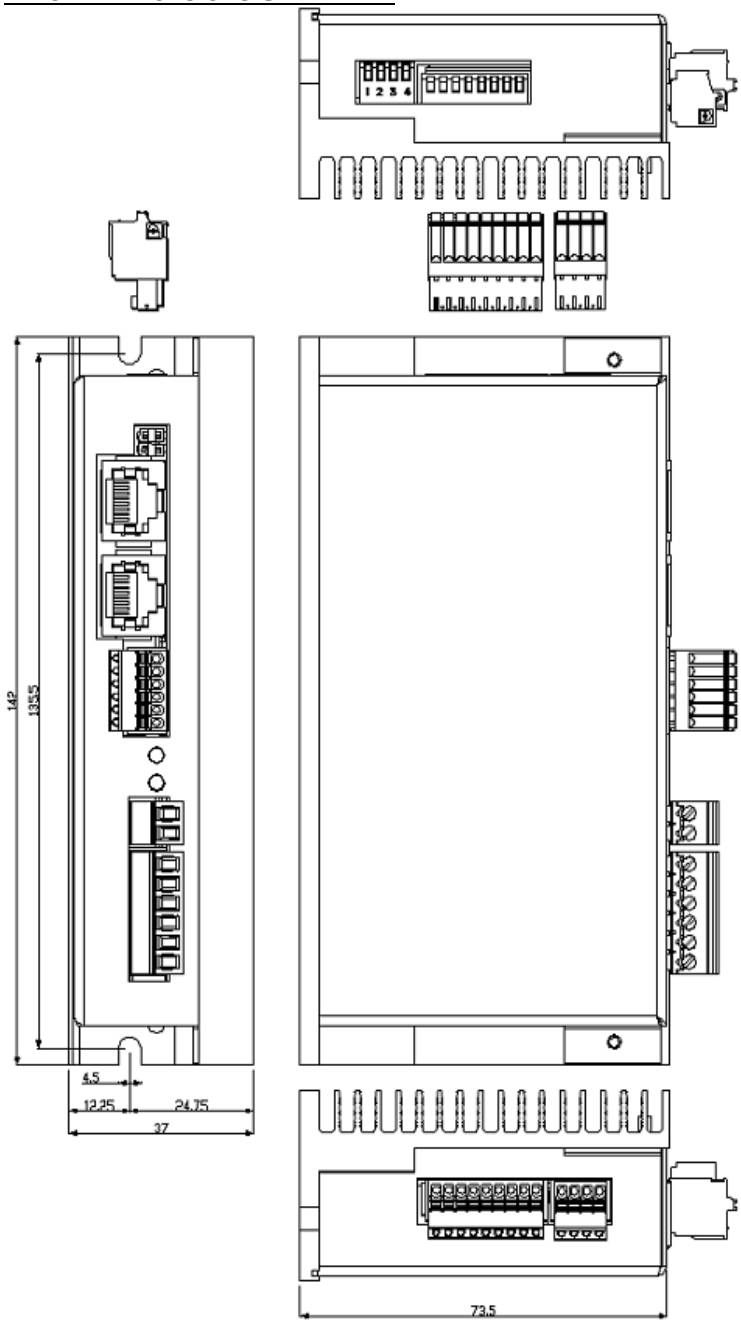
2.1.1 Dimensions SW1D4080__61-00



2.1.2 Dimensions SW1D4080__B1-00



2.1.3 Dimensions SW1Dx142



2.2 Electronics

2.2.1 Power supply

For the functioning of the SW1D____ drives a DC power supply is required. For the technical specifications, limitations and connections related to the power supply, refer to the chapters ***3.2 Power supply of the system*** , ***3.3 Choosing the stepper motor*** and ***4 SW1D____ Versions*** .

		SW1D4080			SW1D2142			SW1D3142 (3)			Unit	Note
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
Power Supply DC	Nominal Voltage	48		140	24	36	40	24	-	80	Vdc	Nominal range
	Voltage limit	43		154	21		44	21		88	Vdc	Including the ripple and network fluctuations.
	Minimal current	0.23			0.2			0.2			A_{RMS}	@ Motor current absent, V+=minimal allowed, no load to the shaft.
	Maximal current		-			-			-		A_{RMS}	@ Maximal motor current, V+=minimal allowed, full step, maximal load to the shaft **(1)**.
	Power		-			-			-		VA	@ Maximal motor current, V+=maximal allowed, full step, maximal load to the shaft **(1).**
Logic Supply DC	Nominal Voltage	24		140	24	36	40	24	-	40	Vdc	Nominal range
	Voltage limit	21		154	21		44	21		44	Vdc	Including the ripple and network fluctuations.
Motor	Current	0,1		8	0,1		4.2			4.2	A_{RMS}	Configurable through software
		0,14		11.28	0,14		6			6	A_{PK}	
	PWM Frequency	Ultrasonic 33KHz (an event every 33µsec)									KHz	
	Step angle	Full step, ½, ¼, 1/8, 1/16, 1/32, 1/64, 1/128										Configurable through software
	Rotation speed			4500			4500			4500	RPM	**(2)**
Drive status		Display 7 segments + dot			Led POWER ON Led FAULT			Led POWER ON Led FAULT				
User settings		8+4 contacts Dip-Switches			8+4 contacts Dip-Switches			8+4 contacts Dip-Switches				Functions depending on the software

(1) **The current and maximal power absorption from the power supply depend on the motor, the load on the shaft and the configured movement parameters.**

(2) Theoretical rotation limit controlled by the drive, depending on the physical parameters where under: power supply voltage, phase current, dynamic characteristics of the motor, load to the shaft. Beyond this limits, the drive is unable to guarantee a correct control of the sequences.

(3) **SW1D3142 has different supply range for power and logic.**

Protections:

Protection	*Trigger*	*Effect*	*Restore*
Over Current Quick electronics protection on the motor outputs against short circuits between the motor phases and between the phases and ground.	Short circuit or excessive current absorption.	- opening of the power stages of the drive. - Reporting on the display of the SW1D4080 - Reporting with FAULT Led on SW1Dx142	It's necessary to switch off the power supply to the drive to remove the cause of the protection.

Protection	*Trigger*	*Effect*	*Restore*
Open Phase Detects the missing of a connection to one or more phases of the motor.	It's impossible for the drive to control the current in the motor.	- Opening of the power stages of the drive. - Reporting on the display of the SW1D4080 - Reporting with FAULT Led on SW1Dx142	It's necessary to switch off the power supply to the drive to remove the cause of the protection.

Protection	*Trigger*	*Effect*	*Restore*
Over Temperature Detects an over temperature of the heat sink.	Temperature of the heat sink >75°C	- Opening of the power stages of the drive. - Reporting on the display of the SW1D4080 -Reporting with FAULT Led on SW1Dx142	Automatically when the temperature drops to a value within the correct range.

Protection	*Trigger*	*Effect*	*Restore*
Over/Under Voltage Detects a power supply voltage out of the functioning range.	(1) Low power supply tension, to high, extra voltage due to BEMF generated by the motor dragged by the load.	- Opening of the power stages of the drive. - Reporting on the display of the SW1D4080 -Reporting with FAULT Led on SW1Dx142	Automatically when the voltage returns to values within the correct range.

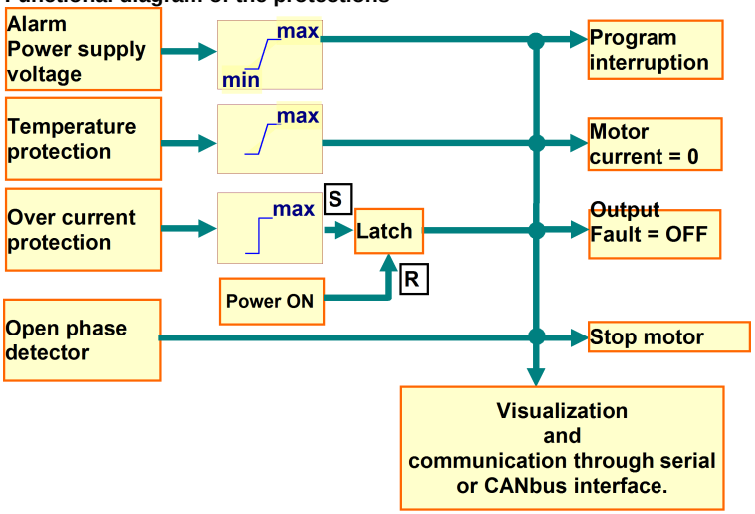
(1) Note : the voltage value is measured on base of the power supply tension

The voltage value is measured on base of the power supply voltage for the motor V+. Eventual voltages out of VLOG and/or 24V_{DC} Range are not detected.

*In the terms of Protection, the operativity of the drive depends on the typology of the protection and the firmware (**A.2 FIRMWARE AND APPLICABLE NOTESErrore: sorgente del riferimento non trovata**). When the protection accomplishes the interruption of the power supply to the motor, some maintenance torque (holding torque) will not be supplied and the load can drag the motor shaft. The user needs to foresee devices to ensure to protection of the load.*

A detailed description of the protections and the related visualizations is given in paragraph **3.8 Operational statuses and their signals** .

Functional diagram of the protections



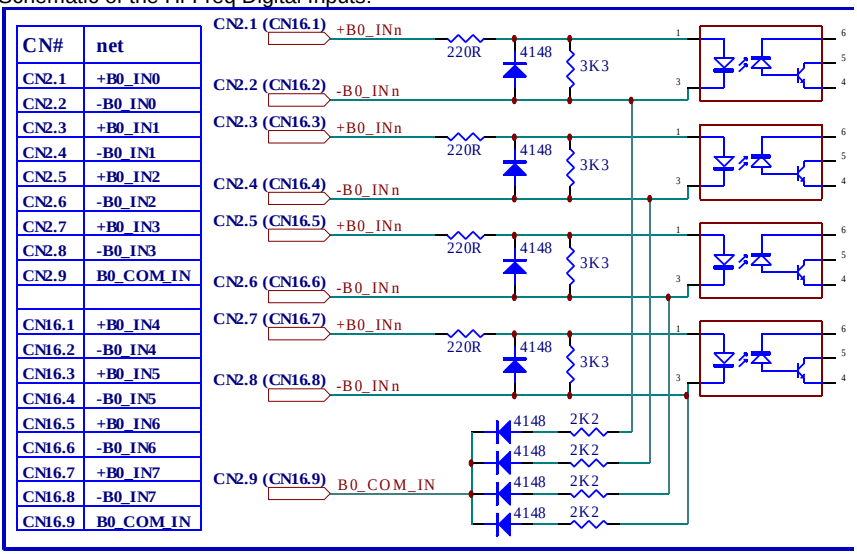
Note :

2.2.2 Hi-freq digital inputs

The *SW1D____* drives are equipped with digital optically isolated inputs with a bandwidth of more then 200KHz, which can be used with $5V_{DC}$ ± 10% PNP, NPN, Push-pull or Line Driver and $24V_{DC}$ ± 25% PNP/Push-Pull by simply altering the external connection to the connector. Depending on the version (verify in chapter ***4 SW1D____ Versions***), there can be present one or two blocks with 4 inputs that go to the connectors CN2 and CN16 of the same type and pin-out.
The Hi-Freq inputs are called ***B0_IN0÷B0_IN7*** (B0_IN0÷B0_IN3 on CN2 and B0_IN4÷B0_IN7 on CN16).

Schematic of the Hi-Freq Digital Inputs:

CN#	net
CN2.1	+B0_IN0
CN2.2	-B0_IN0
CN2.3	+B0_IN1
CN2.4	-B0_IN1
CN2.5	+B0_IN2
CN2.6	-B0_IN2
CN2.7	+B0_IN3
CN2.8	-B0_IN3
CN2.9	B0_COM_IN
CN16.1	+B0_IN4
CN16.2	-B0_IN4
CN16.3	+B0_IN5
CN16.4	-B0_IN5
CN16.5	+B0_IN6
CN16.6	-B0_IN6
CN16.7	+B0_IN7
CN16.8	-B0_IN7
CN16.9	B0_COM_IN



For inputs of $5V_{DC}$, connect between +INn vs -INn ;

For inputs of $24V_{DC}$ PNP or Push-Pull, connect to +INn connecting COM_IN to VSS (reference of +24V); this blocks the possibility to use other inputs of 5V NPN.
For inputs with an intermediate voltage between $5V_{DC}$ ÷ $24V_{DC}$ or for NPN inputs, connect between +INn vs -INn insert a limited resistance in series as in the table here below:

V_{INPUT}	R_{EXT}
$5V_{DC}$	0 Ω
$12V_{DC}$	470 Ω 0.25W
$15V_{DC}$	680 Ω 0.5W
$20÷24V_{DC}$	1200 Ω 0.5W

Use the following formulas to calculate the resistive value and power of the resistors to insert in the series on behalf of the input voltage:
$R_{EXT} = ((V_{INPUT} - 1.25) / 0.017) – 220$
$P_{R_EXT} = ((V_{INPUT} – 1.25) / (R_{EXT} + 220))^2 * R_{EXT}$

Example for: V_{INPUT} =36V :
R_{EXT} =((36-1.25) / 0.017)–220 = 1824 Ω => approximate the commercial value of 1K8
P_{R_EXT} = ((36 – 1.25) / (1800 + 220))^2 * 1800 = 0.533W => approximate the commercial value of 1 W.

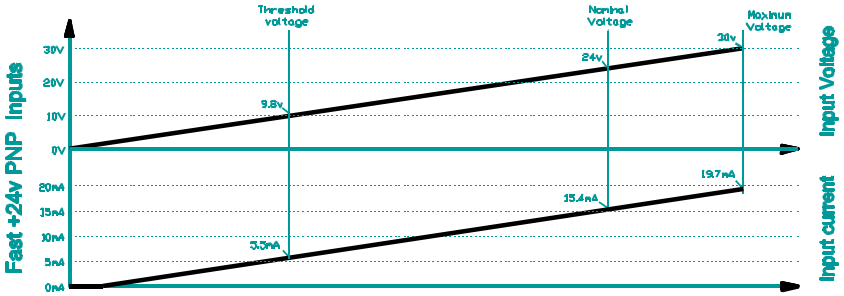
Electrical specifications

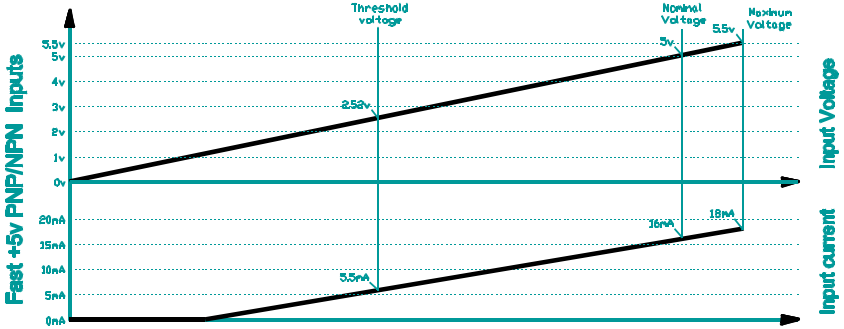
Type of input	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
Hi-Freq	Frequency input (1)			200	KHz
	Pulse duration (T_{ON})	2			µs
	Pulse duration (T_{OFF})	2			µs
+24Vdc PNP Hi-Freq digital inputs	Power supply voltage	19	24	30	V
	Threshold voltage of switching logic	9,8	/	15,8	V
	Current	1.3	15.5	19.7	mA
+5Vdc NPN/PNP Hi-Freq digital inputs	Power supply voltage	4,5	5	5,5	Vdc
	Threshold voltage of switching logic	2,5			Vdc
	Current	5,5	16	18	mA

(1) Depending on the installed firmware (A.2 FIRMWARE AND APPLICABLE NOTES), there may be some special requirements for the input frequencies.

(2) Refer to the software manuals (A.1 Manuals and applicable documentation) for more details.

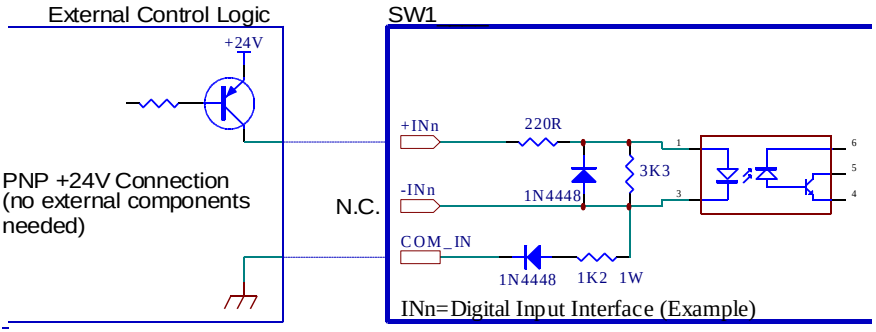
The following diagrams show the threshold voltage, in voltage and current, for the Digital Hi-Freq inputs of 5 Vdc and 24 Vdc.



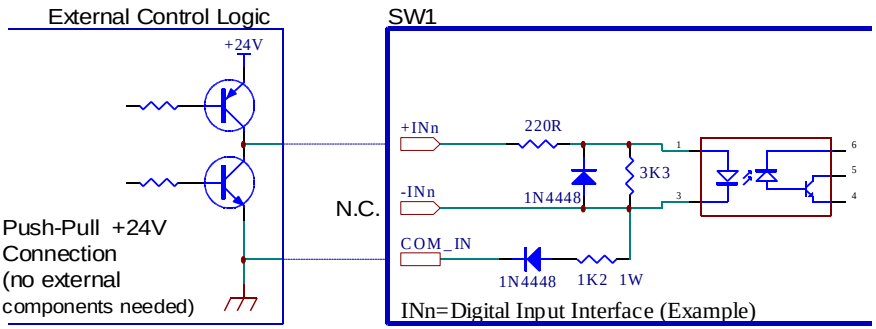


The following figures provide some examples of possible connections to the High-Freq Digital inputs.

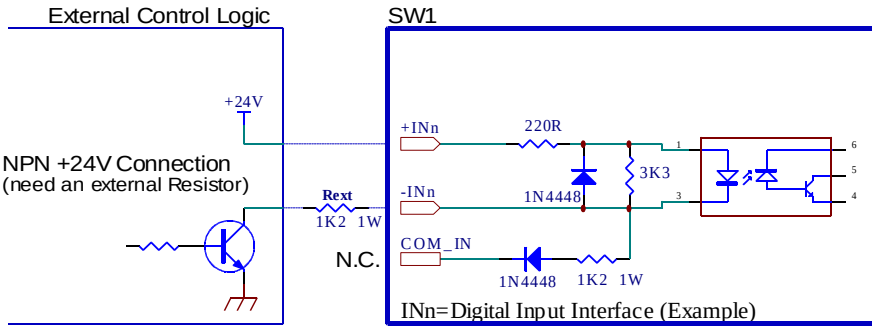
- Control PNP 24V$_{DC}$



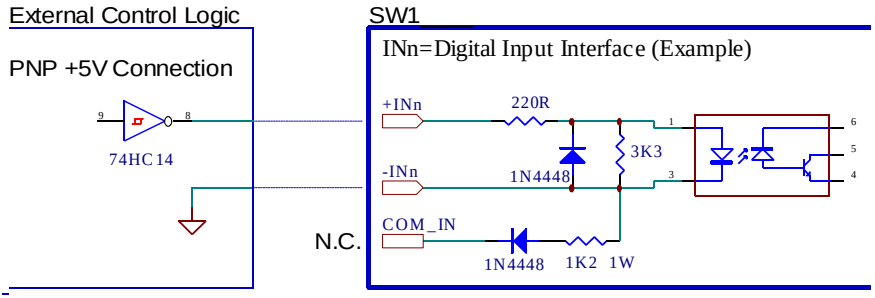
- Control Push-Pull 24V$_{DC}$



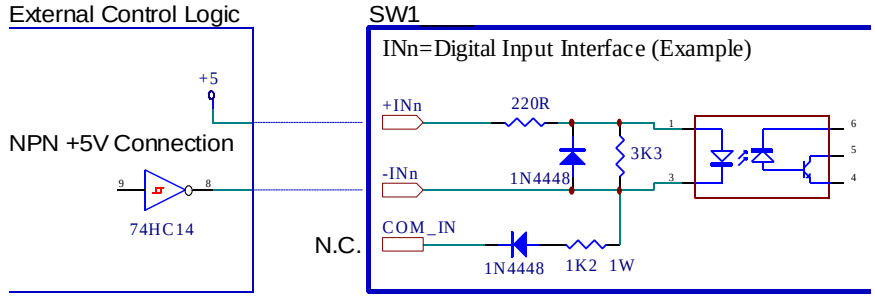
- Control NPN 24V$_{DC}$



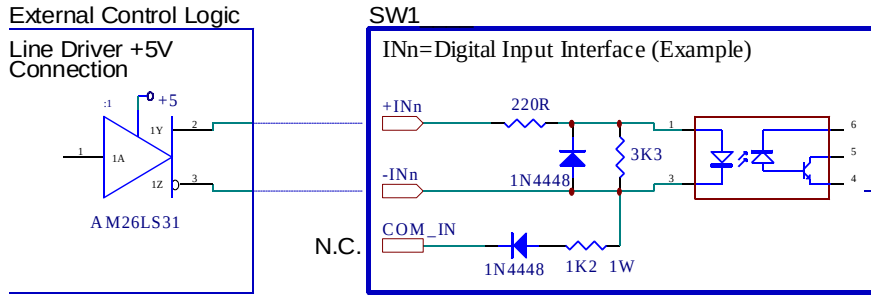
- Control PNP $5V_{DC}$



- Control NPN $5V_{DC}$



- Control Line Driver $5V_{DC}$



For a proper use, the Hi-Freq Digital inputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables of the Hi-Freq Digital inputs are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph ***3.5.3 Guideline for wiring*** *.*

The functions of the Hi-Freq Digital inputs depend on the firmware installed on the drive ***(A.2 FIRMWARE AND APPLICABLE NOTES)****. Refer to the Software manuals* ***(A.1 Manuals and applicable documentation).***

2.2.2.1 Connection of an incremental encoder

The *SW1D____ systems are able to interface with an incremental quadrature encoder connecting to the first block of Hi-Freq Digital inputs (CN2).*
The connection of the encoder signals, depending on the user needs, must be realised as indicated in the table:

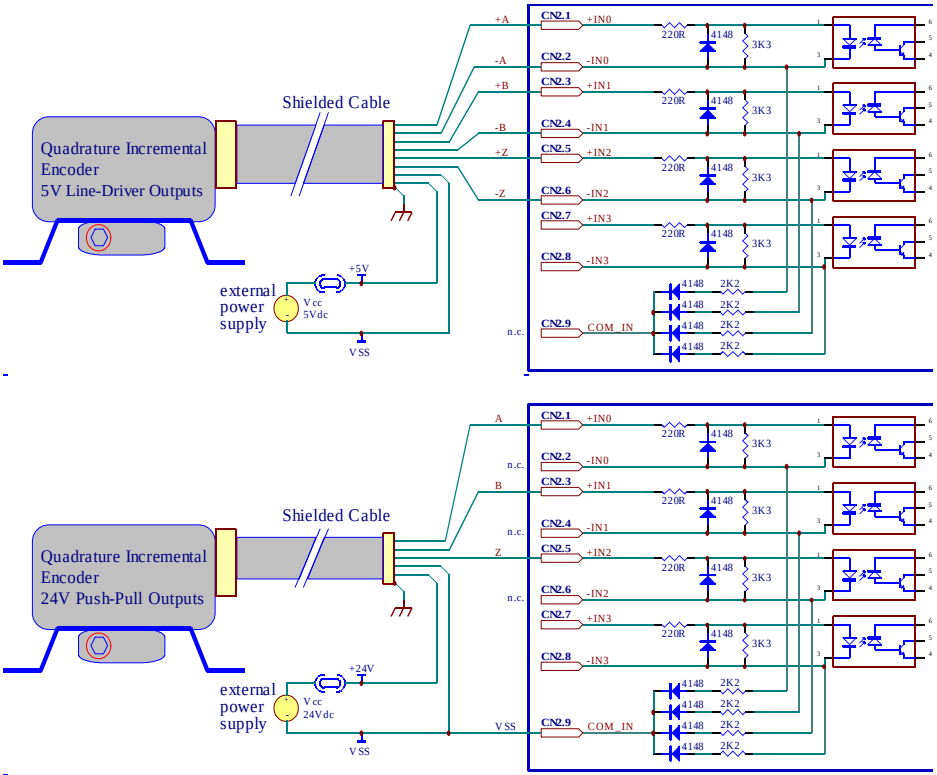
SW1 (Slim Line Series Drives)			
Input	**Encoder Quadrature**	**Up/down Counter**	**Up Counter**
B0_In0	Phase A Encoder #0	//	//
B0_In1	Phase B Encoder #0	//	//
B0_In2	Phase A Encoder #1	Encoder #1(dir)	//
B0_In3	Phase B Encoder #1	Encoder #1 (clock)	Encoder #1(clock)

*The features related to the reading of the incremental encoders, depend on the Firmware installed on the drive **(A.2 FIRMWARE AND APPLICABLE NOTES)**.Refer to software manuals (**A.1 Manuals and applicable documentation).***

The Zero Encoder (Index) signal is considered to be a General Purpose Input, and thus can be connected to any free Hi-Freq input.

The Encoder must be powered by an external Power Supply.

Examples of encoder connections of 5V Line-Driver and 24V Push-Pull.



2.2.3 Std Digital Inputs

The *SW1D____* drives are equipped with digital optically isolated inputs with a bandwidth until 250 Hz, which can be used in PNP mode, Push-pull, NPN, at $5V_{DC}$ and at $24V_{DC}$ simply modifying the external connection to the connector.

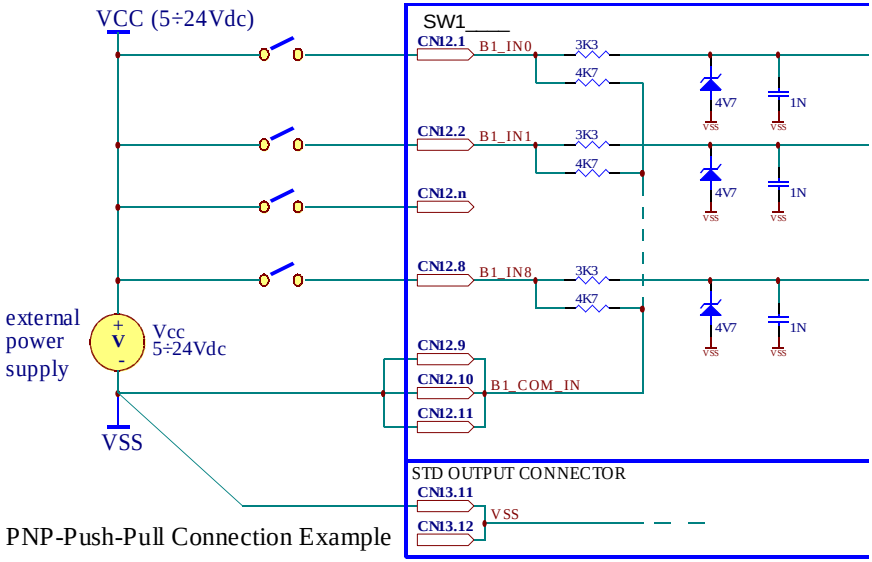
Their presence depends on the drive version: verify in chapter **4 SW1D____ Versions**.

The Std inputs are denominated ***B1_IN0÷B1_IN7*** and belong to connector CN12.

For the functioning of the Std digital inputs, the section of the Std digital outputs has to be powered with 24 Vdc (+24Vdc=CN13.9-10 , VSS=CN13.11-12). This power supply is also needed for the functioning of the Std outputs.

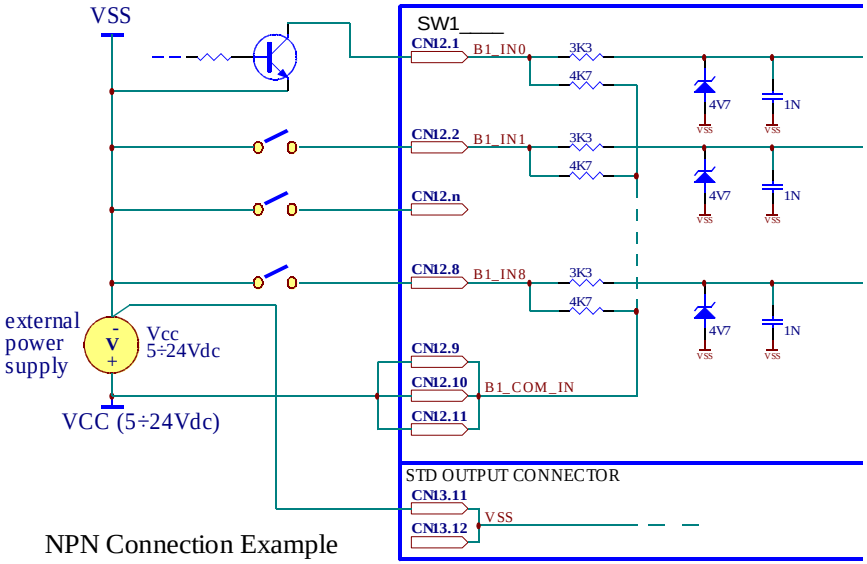
It's also necessary that the reference (ground) of the generator, which is used for the commitment of the inputs, is referred to the ground of the Std Digital outputs (CN13.11 – CN13.12).

Schematic of the Std Digital Inputs in Push-Pull and PNP mode:



PNP-Push-Pull Connection Example

Schematic of the Std Digital Inputs in NPN mode:



NPN Connection Example

Electrical specifications

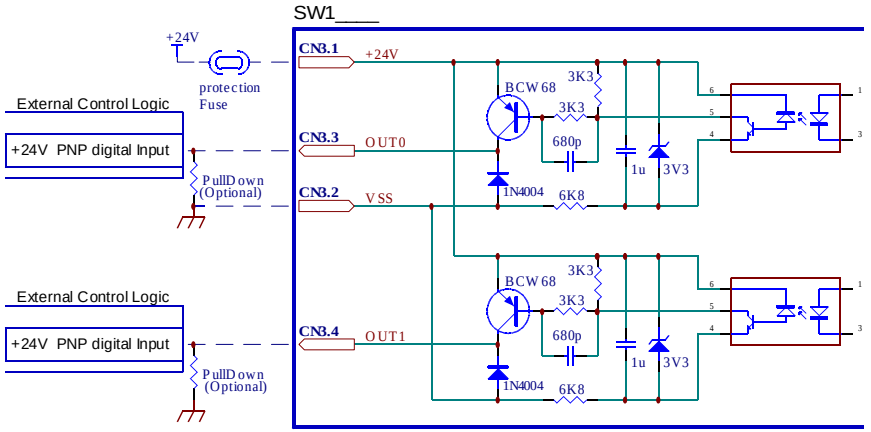
Input type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
STD Digital Inputs	Frequency input (1)			250	Hz
	Pulse duration (T_{ON})	2			ms
	Pulse duration	2			ms
	Power supply Voltage	4.5		30	V
	Threshold voltage of switching logic.	3.3			V
	Current			14	mA

(1) ***Depending on the installed firmware (A.2 FIRMWARE AND APPLICABLE NOTES, there may be some special requirements for the frequency input. For more details refer to the software manuals (A.1 Manuals and applicable documentation).***

2.2.4 Hi-Freq Digital Outputs

The SW1D____ drives are equipped with 2 Hi-Freq Digital optically isolated outputs of $24V_{DC}$ 100mA (PNP source type, forcing of 24V and not forcing of 0V) which refer to the connector CN3.

Schematic of Hi-Freq Digital Outputs :



For proper use, the Hi-Freq digital outputs must be wired using shielded cables. The connection of the screen should be evaluated for every application; depending on the lay out of the machine. Generally, it's the best to connect the screen from both sides to the ground. It's important that the cables of the Hi-Freq digital outputs are not exposed to disturbances. Therefore it is important to follow the instructions defined in paragraph ***3.5.3 Guideline for wiring .***

The functions of the digital outputs depend on the firmware installed on the drive ***(A.2 FIRMWARE AND APPLICABLE NOTES****). Refer to software manuals* ***(A.1 Manuals and applicable documentation****).*

Electrical specifications

Type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
PNP Transistor Output	Power supply voltage output	19	24	30	V
	Voltage drop on output			0,3	V
	Output current			100	mA
	Output frequency			40	KHz
	Pulse duration (T_{ON})	10			µs
	Pulse duration (T_{OFF})	10			µs
	Rise time (T_{RISE})			1	µs
	Fall time (T_{FALL})			(1)	

(1) depending on the load.

Attention: The Hi-Freq Digital Outputs are not protected.
Foresee an external current limiting device (I_{OUTmax} = 100mA) .
The protective device can be placed on the power supply conductor +24V_{DC} of the outputs (CN3.1) and dimensioned for the sum of the maximum current released by the 2 outputs, or in series to each of the outputs and calibrated according to the load.

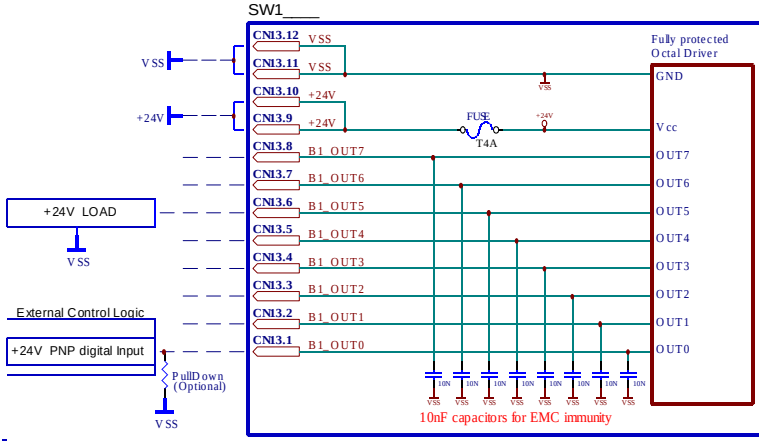
2.2.5 Std Digital Outputs

The *SW1D____* drives are equipped with digital optically isolated outputs with a band width up to 250 Hz. The outputs are of the type Open Source 24V (PNP source type, forcing of 24V and not forcing of 0V) and can be used with resistive and inductive loads. Their presence depends on the drive version: verify in chapter ***4 SW1D____ Versions***.

The Std digital outputs are denominated ***B1_OUT0÷B1_OUT7*** and belong to the connector CN13.

For the functioning of the Std digital outputs, it's necessary to have a power supply of +24Vdc=CN13.9-10 , VSS=CN13.11-12. This power supply is also needed for the functioning of the Std digital inputs.

Schematic of the Std digital outputs:



For proper use, the Std digital outputs have to be wired using shielded cables. The connection of the screen has to be evaluated for every application; depending on the lay-out of the machine. Generally, it's the best to connect the screen from both sides to the ground. It's important that the cables of the Std digital outputs are not exposed to disturbances. Therefore it is important to follow the instructions defined in paragraph ***3.5.3 Guideline for wiring.***

The functionality of the digital outputs depends on the firmware installed on the drive ***(A.2 FIRMWARE AND APPLICABLE NOTES****) Refer to software manuals* ***(A.1 Manuals and applicable documentation****).*

Electrical specifications

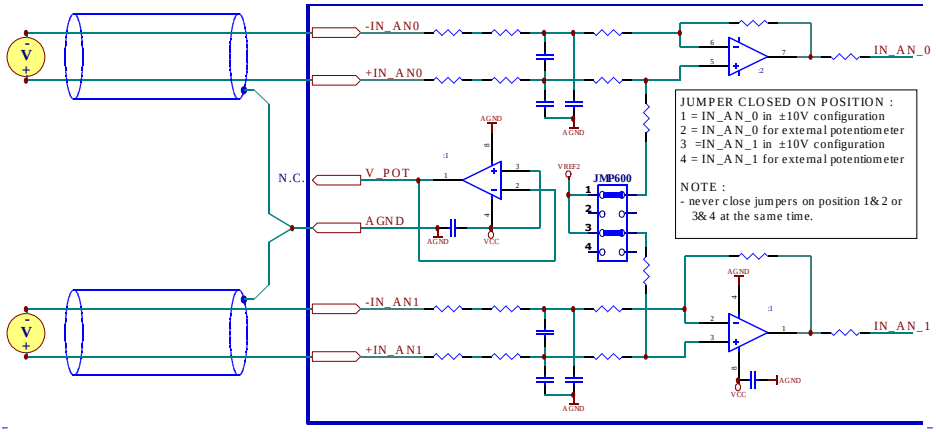
Type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
Std Outputs	Power supply voltage output	19	24	30	V
	Voltage drop on output			0.1	V
	Output current			100	mA
	Output frequency			250	Hz
	Pulse duration (T_{ON})	2			ms
	Pulse duration (T_{OFF})	2			ms
	Rise time (T_{RISE})			(1)	µs
	Fall time (T_{FALL})			(1)	

(1) depending on the load

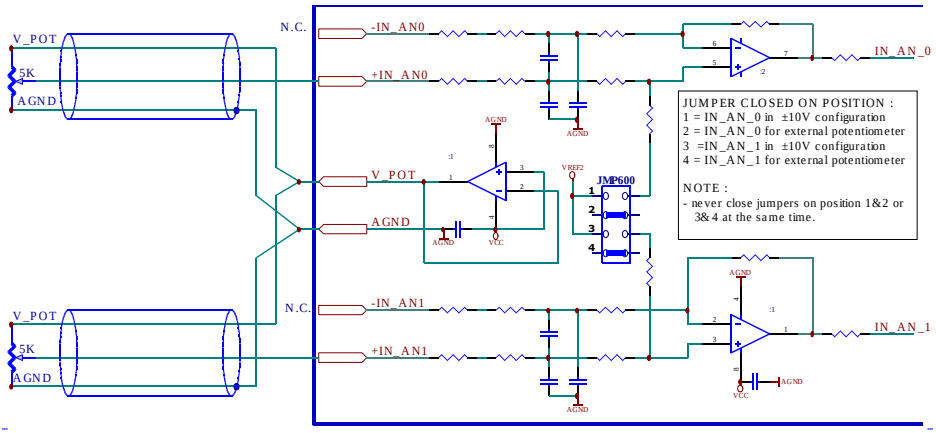
2.2.6 Analog inputs

The *SW1D____* drive is equipped with 2 not isolated analog inputs which refer to connector CN4. The analog inputs can be configured through the jumper JMP600, for a functioning range of ±10V or for a direct interfacing with the external potentiometers.

Schematic of the analog inputs with 10V configuration:



Schematic of the analog Inputs with potentiometer configuration:



*The position of the jumper JMP600 is indicated in paragraph **3.5.1 Connectors, Dip-Switches, Jumpers, Display of SW1D4080** and **3.5.2 Connectors, Dip-Switches, Jumpers, LEDs on SW1Dx142**; the detailed functions are described in paragraph **3.6.2 Jumpers.***

*The functions of the analog inputs depend on the Firmware installed on the drive **(A.2 FIRMWARE AND APPLICABLE NOTES)**. Refer to Software Manuals **(A.1 Manuals and applicable documentation**).*

For a proper use, the analog inputs have to be wired using shielded cables. The connection of the screen has to be evaluated for every application; depending on the lay-out of the machine. Generally, it's the best to connect the screen from both sides to the ground (PE), or from one drive side to pin CN4.2 (AGND).
*It's important that the cables of the analog inputs are not exposed to disturbances. Therefore it is important to follow the instructions defined in paragraph **3.5.3 Guideline for wiring.***

Attention: the reference ground of the potentiometer is the same as the power supply ground of the motor, thus potentially dangerous. Take all necessary measures to avoid possible contacts.

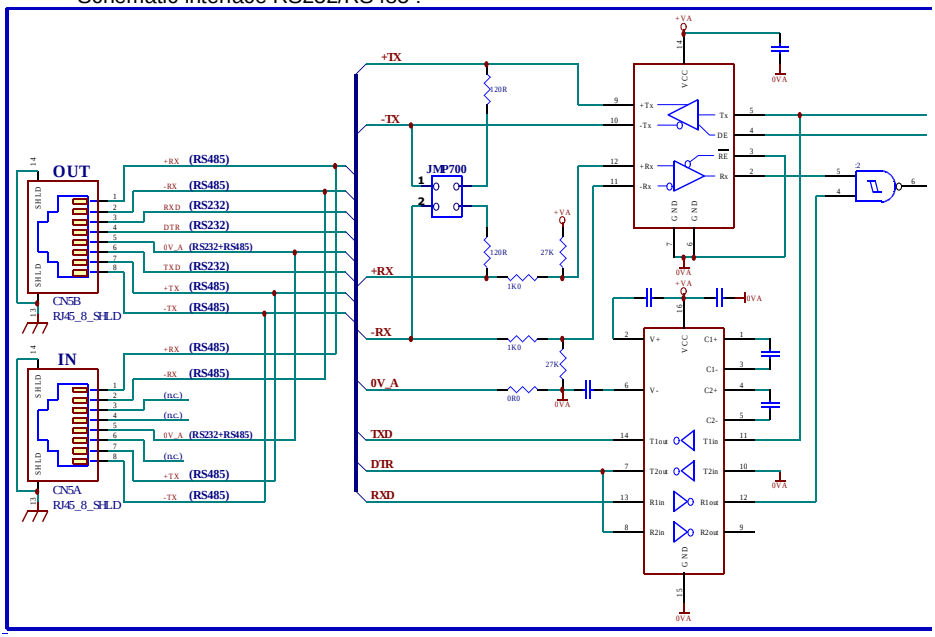
Electrical specifications

Type	CHARACTERISTICS	SW1D4080 typ.	SW1Dx142 typ.	Unit
n. 2 differential analog inputs not isolated compatible CEI EN61131-2	Input type	Differential not isolated		
	Nominal input voltage	±10	±10	V
	Input impedance	2Meg	2Meg	Ω
	Read resolution (value LSB)	5.8	5.8	mV
	Resolution ADC	12	12	bit
	Maximum error over the entire temperature range.	5	5	%
	Maximal overload	±400V	±100V	V
	Digital output value in case of overload (with positive input)	4095	4095	ADC value
	Sampling duration (T_{SAMPLE})(minimal)	1.12	1.12	µs
	Sampling period	8.96	8.96	µs
	Characteristics of the input filter	HW : low pass 1°order F0=3.4KHz SW :settable		
	Type of protection	Isolation and limitation of current.		
	Conversion method	Sample & Hold		
	Mode of functioning	Auto-scan		

2.2.7 Serial interface RS232/RS485

The interface RS232 allows a point-to-point connection while the RS485 interface permits a multi-point link connection conforming the standards EIA/TIA232E CCIT V.28 and RS-485 CCITT V.11 X.27. The isolated interface is supplied of power through an internally isolated DC/DC converter, no external power supply is needed.
The SW1D____ drives are equipped with 2 connectors RJ45 8 parallel pins (CN5A and CN5B) to simplify the connection of the nodes to the MODBUS ® network.

Schematic interface RS232/RS485 :



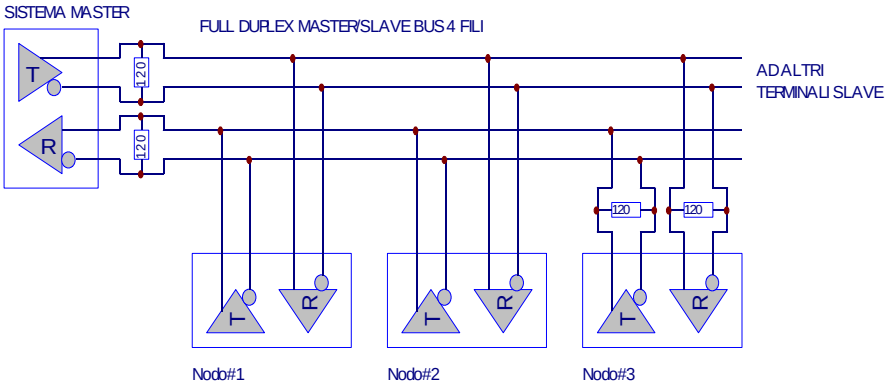
Refer to section ***4 SW1D____ Versions*** for information related to the available drive versions.

Refer to software manuals **(A.1 Manuals and applicable documentation)** for information about the functioning of the RS232/RS485 interface.

For a proper use, the communication interfaces must be wired using shielded cables. The connection to the screen must be evaluated for every application, following the lay-out of the machine. Generally, it's the best to connect the screen from both sides to the ground, It's important that the cables of the communication interfaces are not exposed to disturbances. Therefore it is important to follow the instructions defined in paragraph ***3.5.3 Guideline for wiring.***

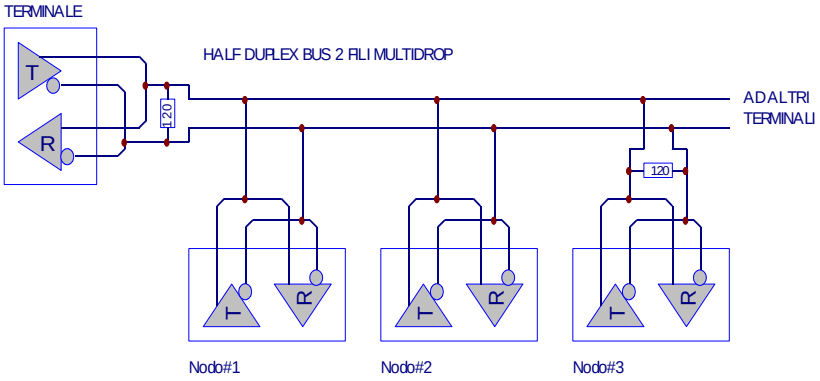
*For information about the cable schematics and adapters, refer to appendix **A.3 Cables and adapters**.*

Connection to the RS485 network



Nota: il primo e l'ultimo sistema della rete devono avere la resistenza di terminazione inserita

In Full-Duplex configuration, if a SW1D____ system is present in the beginning or at the end of the network, the terminal resistor can be inserted closing the jumper JMP700 in position 1 and 2.



Nota: il primo e l'ultimo sistema della rete devono avere la resistenza di terminazione inserita

The Half-Duplex configuration is obtained by connecting the conductors externally:
+Tx with +Rx
-Tx with -Rx

In Half-Duplex configuration, if a SW1D____ system is present in the beginning or at the end of the network, the terminal resistor can be inserted by closing the jumper JMP700 indifferently in position 1 or 2.

In Half-Duplex, DO NOT close at the same time JMP700 in position 1 and 2, as the line would be charged excessively.

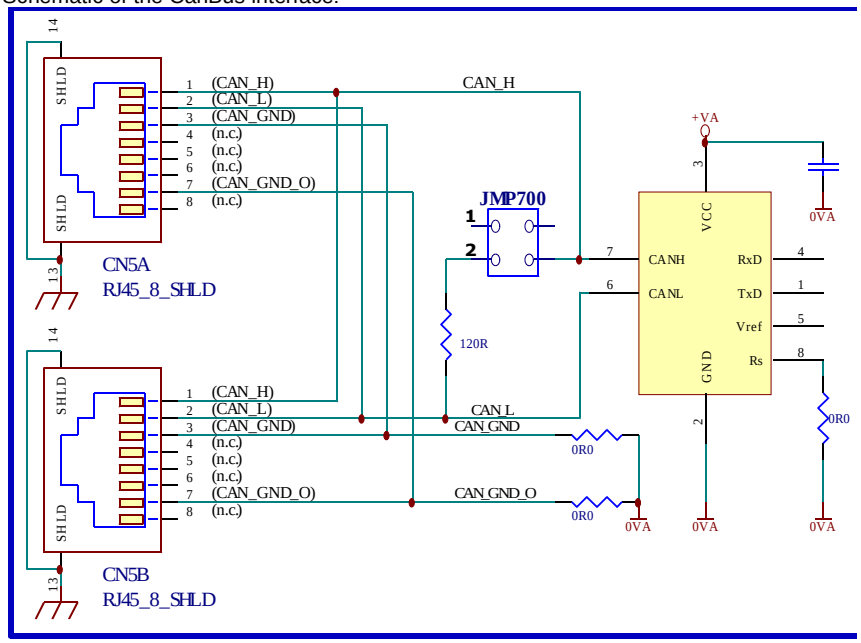
*The position of the jumper JMP700 is indicated in paragraph **3.5.1 Connectors, Dip-Switches, Jumpers, Display of SW1D4080** and **3.5.2 Connectors, Dip-Switches, Jumpers, LEDs on SW1Dx142**; the detailed functions are described in paragraph **3.6.2 Jumpers**.*

2.2.8 CanBus Interface

The CAN bus interface allows a multi-point connection in accordance to the ISO 11898 standard. The isolated interface is supplied of power through an internally isolated DC/DC converter, no external power supply is needed.

The SW1D____ drives are foreseen of 2 RJ45 connectors with 8 paralleled pins (CN5A and CN5B) to simplify the connection of the nodes to the CanBus network.

Schematic of the CanBus interface:



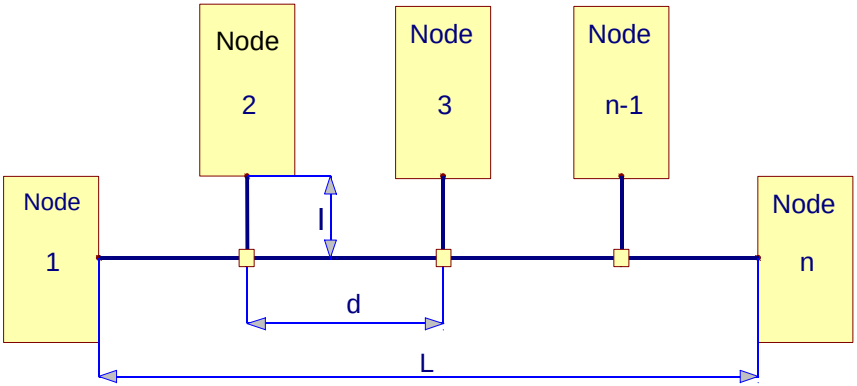
*Refer to section **4 SW1D____ Versions** for information about the available drive versions. Refer to the software manuals **(A.1 Manuals and applicable documentation**) for information about the functioning of the CANbus interface.*

For a proper use, the communication interfaces must be wired using shielded cables. The connection to the screen must be evaluated for every application, following the lay-out of the machine. Generally, it's the best to connect the screen from both sides to the ground.

*It's important that the cables related to the communication interfaces are not exposed to disturbances. Therefore it is important to follow the instructions defined in paragraph **3.5.3 Guideline for wiring** .*

*For information about the cable and adapter schematics, refer to appendix **A.3 Cables and adapters.***

Connection to the CANbus network

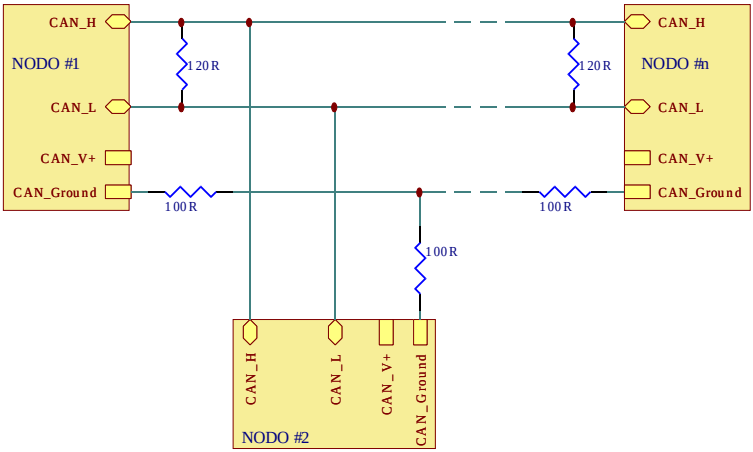


Network parameters (from ISO 11898)						
Parameters	**Size**	**Unit**	**Values**			**Conditions**
			Min.	**Nom.**	**Max.**	
Bus length	L	m	0		40	
Deviation length	l	m	0		0.3	Bit rate: 1Mbit/sec
Nodes distances	d	m	0.1		40	

From Can In Automation (CIA)				
Bus length	**Cable**		**Termination resistance**	**Data rate max [kbit/s]**
	Res/m	**Section**		
0..40m	70 mΩ/m	0.25mm²..0.34mm² AWG23, AWG22	124Ω (1%)	1 Mbit/s at 40m
40..300m	< 60 mΩ/m	0.34mm²..0.6mm² AWG22, AWG20	127Ω (1%)	500 Kbit/s at 100m
300..600m	< 40 mΩ/m	0.5mm²..0.6mm² AWG20	150Ω to 300Ω	100 Kbit/s at 500m
600m..1km	< 26 mΩ/m	0.75mm²..0.8mm² AWG18	150Ω to 300Ω	50 Kbit/s at 1Km

Cabling Used cables with braided and shielded wires.
requirements : ***Refer to the specifications defined by Can In Automation (CiA).***

Schematic of the CANopen network:



Note: the first and last system connected to the network must have a termination resistance. The CAN_ground connection is optional. If a SW1D____ system is present in the beginning or at the end of the network, the termination resistance can be inserted closing jumper JMP700 in position 2.

*The position of jumper JMP700 is indicated in paragraph **3.5.1 Connectors, Dip-Switches, Jumpers, Display of SW1D4080** and **3.5.2 Connectors, Dip-Switches, Jumpers, LEDs on SW1Dx142**; the detailed functions are described in paragraph **3.6.2 Jumpers**.*

2.3 Standards

The EVER *SW1D____* drives have been designed and manufactured following the next Directives and Standards :

Directives :	73/23/CE	Low Voltage Material
	89/392/CE	Machinery
	89/336/CE	Electromagnetic compatibility
Standards :	EN 61800-3	Drives of variable speed – Electromagnetic compatibility and specific testing methods.
	EN 61800-5-1	Drives of variable speed – Security requirements.
	EN 60204-1	Safety of machinery – Electrical equipment of machines.

The compliance of the EVER products with the Directives of Electromagnetic compatibility can only be checked if the complete machine, from which the drive is a device, has been designed and realized in compliance with the requirements for Electromagnetic Compatibility.

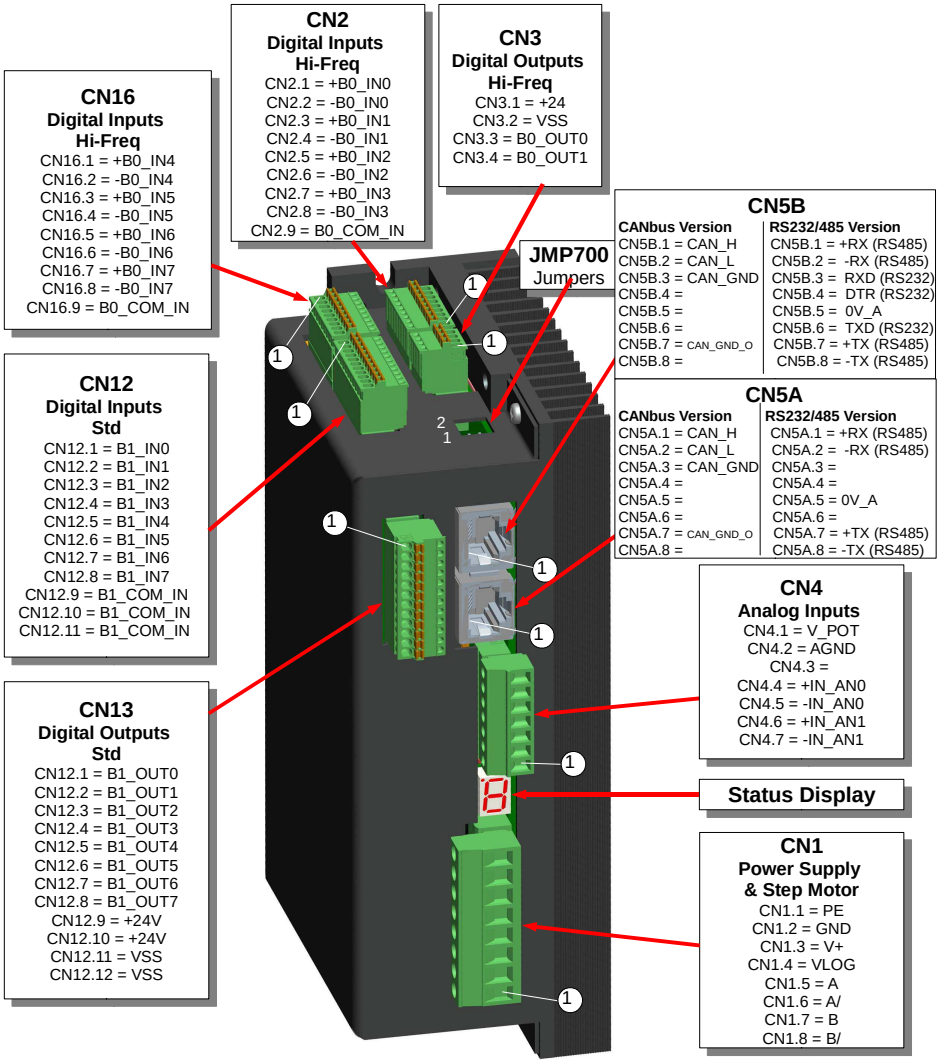
The installation of the drive has to be executed in accordance with the guidelines outlined in chapter ***3 INSTALLATION OF THE DRIVE***.

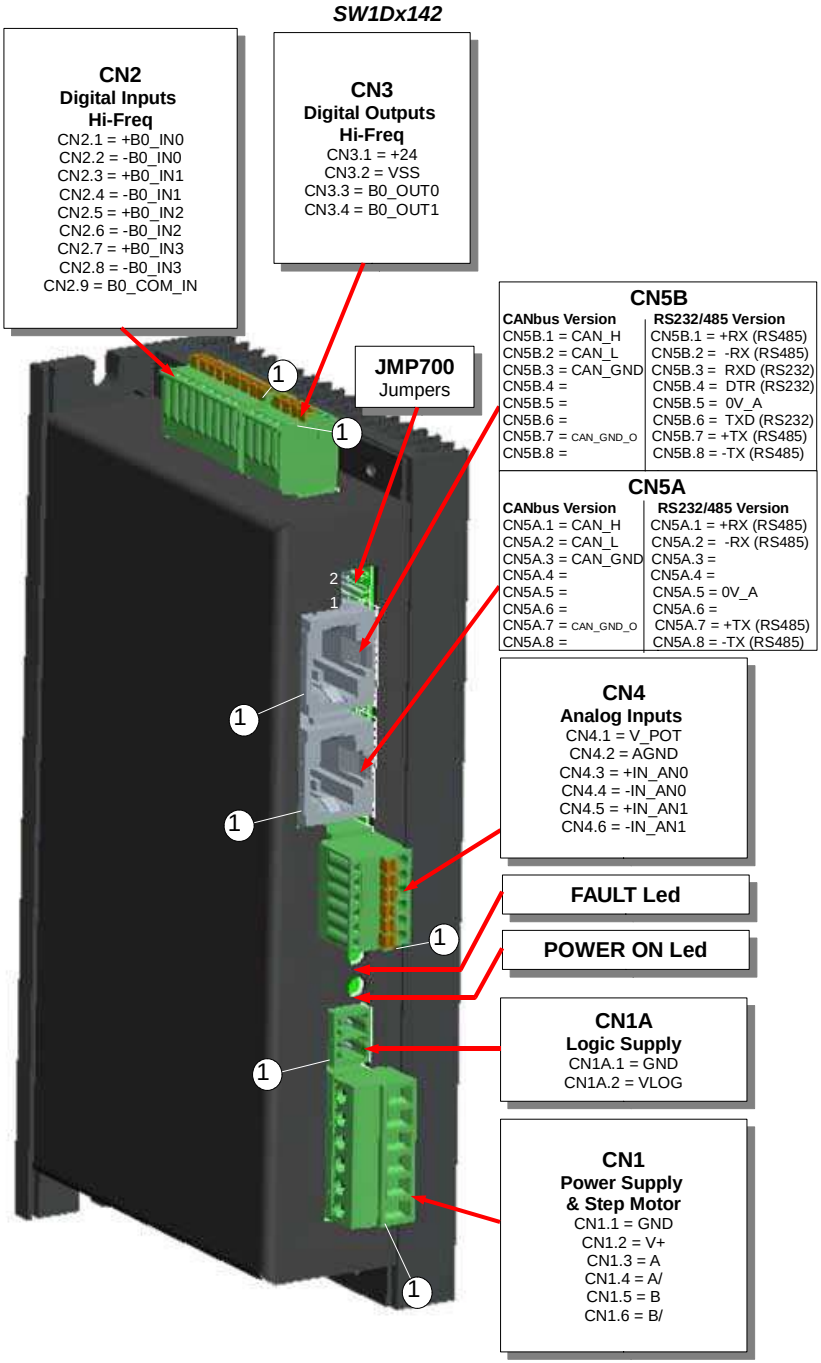
Note :

3 INSTALLATION OF THE DRIVE

In this section are given some guidelines for the safe installation of the SW1D____ drives and the stepper motor.

SW1D4080__B1-00




SW1Dx142
CN2
Digital Inputs
Hi-Freq
CN2.1 = +B0_IN0
CN2.2 = -B0_IN0
CN2.3 = +B0_IN1
CN2.4 = -B0_IN1
CN2.5 = +B0_IN2
CN2.6 = -B0_IN2
CN2.7 = +B0_IN3
CN2.8 = -B0_IN3
CN2.9 = B0_COM_IN
CN3
Digital Outputs
Hi-Freq
CN3.1 = +24
CN3.2 = VSS
CN3.3 = B0_OUT0
CN3.4 = B0_OUT1
JMP700
Jumpers
CN5B
CANbus Version
CN5B.1 = CAN_H
CN5B.2 = CAN_L
CN5B.3 = CAN_GND
CN5B.4 =
CN5B.5 =
CN5B.6 =
CN5B.7 = CAN_GND_O
CN5B.8 =
RS232/485 Version
CN5B.1 = +RX (RS485)
CN5B.2 = -RX (RS485)
CN5B.3 = RXD (RS232)
CN5B.4 = DTR (RS232)
CN5B.5 = 0V_A
CN5B.6 = TXD (RS232)
CN5B.7 = +TX (RS485)
CN5B.8 = -TX (RS485)
CN5A
CANbus Version
CN5A.1 = CAN_H
CN5A.2 = CAN_L
CN5A.3 = CAN_GND
CN5A.4 =
CN5A.5 =
CN5A.6 =
CN5A.7 = CAN_GND_O
CN5A.8 =
RS232/485 Version
CN5A.1 = +RX (RS485)
CN5A.2 = -RX (RS485)
CN5A.3 =
CN5A.4 =
CN5A.5 = 0V_A
CN5A.6 =
CN5A.7 = +TX (RS485)
CN5A.8 = -TX (RS485)
CN4
Analog Inputs
CN4.1 = V_POT
CN4.2 = AGND
CN4.3 = +IN_AN0
CN4.4 = -IN_AN0
CN4.5 = +IN_AN1
CN4.6 = -IN_AN1
FAULT Led
POWER ON Led
CN1A
Logic Supply
CN1A.1 = GND
CN1A.2 = VLOG
CN1
Power Supply
& Step Motor
CN1.1 = GND
CN1.2 = V+
CN1.3 = A
CN1.4 = A/
CN1.5 = B
CN1.6 = B/

3.1 Safe installation and use of the unit

Only qualified staff can install the SW1D____ drives, after having read and understood the information in this manual. The installation instructions have to be followed and approved. Eventual doubts need to be clarified with the supplier of the equipment before using.

EVER will not take any responsibility for indirect damage due to negligence, wrong installation, modifications to the product without approval or wrong connections of the equipment to the wiring.

SECURITY
Specially, the user needs to:

- Remove the power supply before realizing or removing a connection:
- Don't work on the drive without that has been realized a ground connection for the drive and the motor. The Protective Earth connection (PE) has to comply with the local requirements in force.

- Don't establish connections to the internal circuit of the drive;
- Wait until the display or the green LED light of POWER_ON is not completely switched off before manipulating or executing maintenance to the drive;
- Don't use a digital input with ENABLE function such as safety stop. Always remove the power supply voltage from the drive to establish a safe switching off;
- Pay attention to the heat loss of some parts of the drive: using the drive in extreme applications, some surfaces reach high temperatures.
- Before disconnecting the device, wait until it has cooled down;
- In case of missing voltage the motor is not able to keep the load: it's thus forbidden to use the motor if the condition of missing holding torque of the motor can create a dangerous situation, unless the user provides special devices to block the load.
- Don't remove the cover except in case explained in the installation section. The open operation will invalidates the warranty conditions of the product.

*The negative pole of the power supply is **NOT** connected to the ground through an internal connection to the drive. If this default connection doesn't suit the requirements of the application, the user needs to refer to support@everelettronica.it for the necessary technical information.*

ELECTROMAGNETIC COMPATIBILITY

Take into account all precautions and requirements which are necessary for the compliance with the electromagnetic compatibility.

Some disturbances generated by other insufficiently filtered or shielded equipment, can cause malfunctions in the drive which can result into uncontrolled movements.

The implementation of the connections should take into account the requirements defined in paragraph: ***3.5.3 Guideline for wiring.***

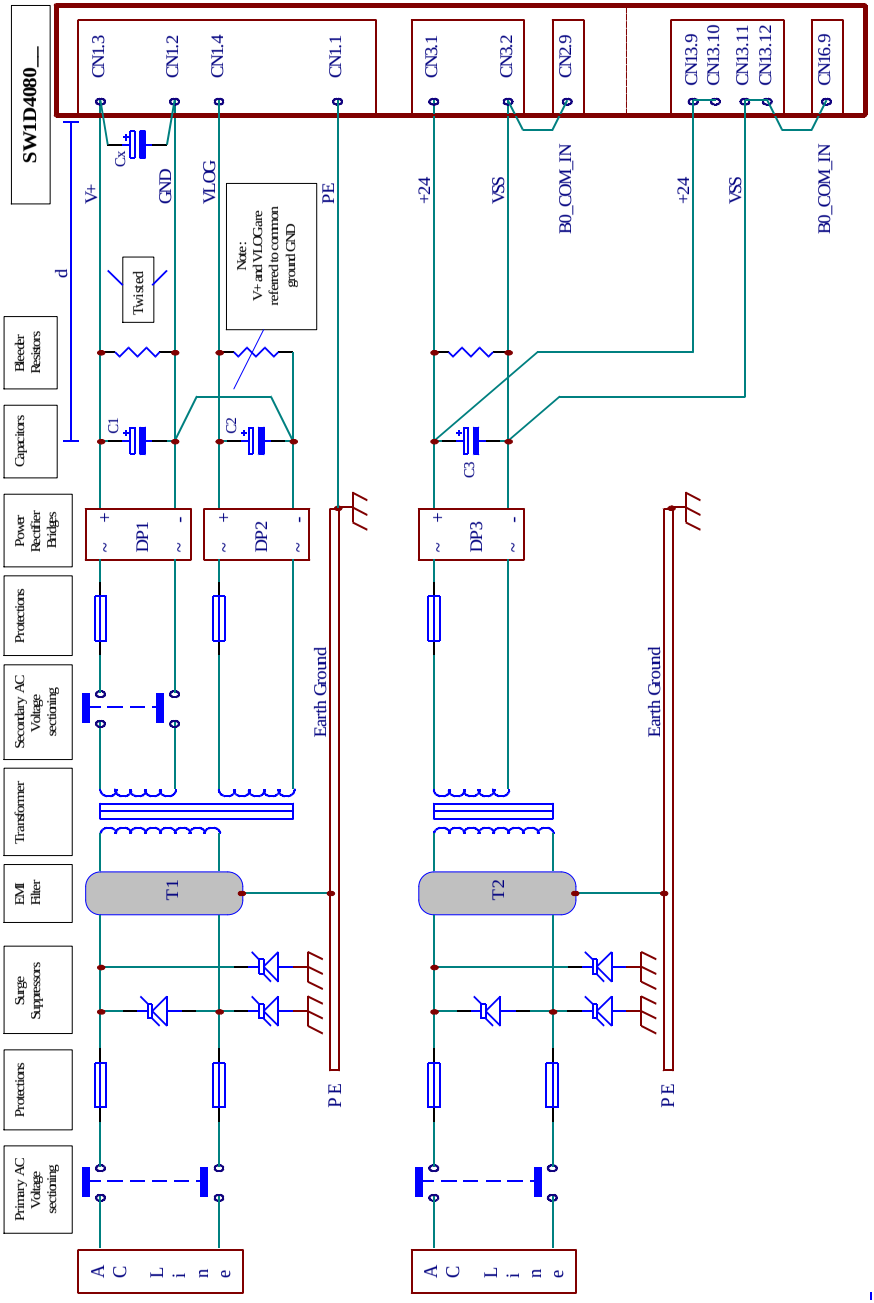
The drive, when functioning, generates emissions which, if not filtered adequately, can disturb the correct functioning of other devices.

The final user needs to evaluate if the installation of an adequate filtering system is necessary, based on the requirements of his application (EMC line filter).

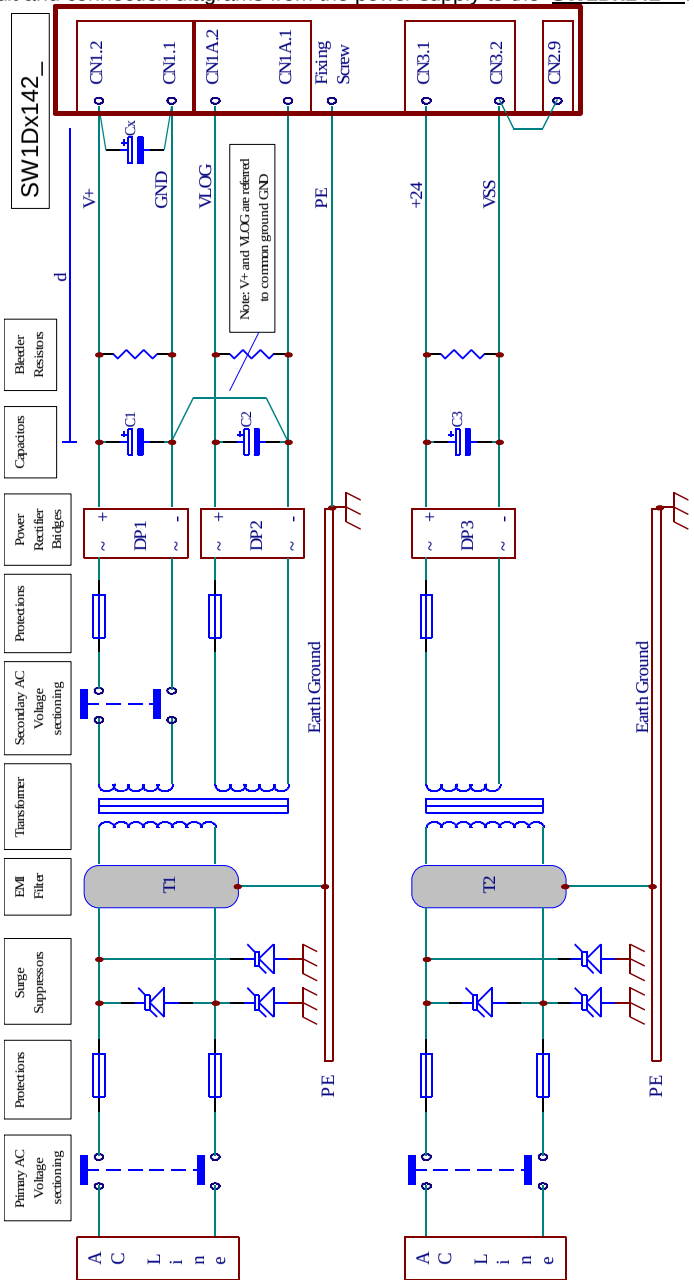
Note :

3.2 Power supply of the system

Circuit and connection diagrams from the power supply to the ***SW1D4080___***.



Circuit and connection diagrams from the power supply to the ***SW1Dx142___***.



SW1D3142 has different supply range for power and logic.
(see paragraph 2.2.1 Power supply)

The two diagrams indicate the differences between the systems SW1D4080 and SW1Dx142 concerning the power supply:

- *different type of connector (CN1 per step 5.08mm for SW1D4080 per step 3.81mm for SW1D2141) and different pin-out;*
- *Absence of the CN1 pin connector on the SW1Dx142 used for the protective earth connection to be connected to a clamping screw.*

The SW1D____ drives need to be powered by DC power supply sources.

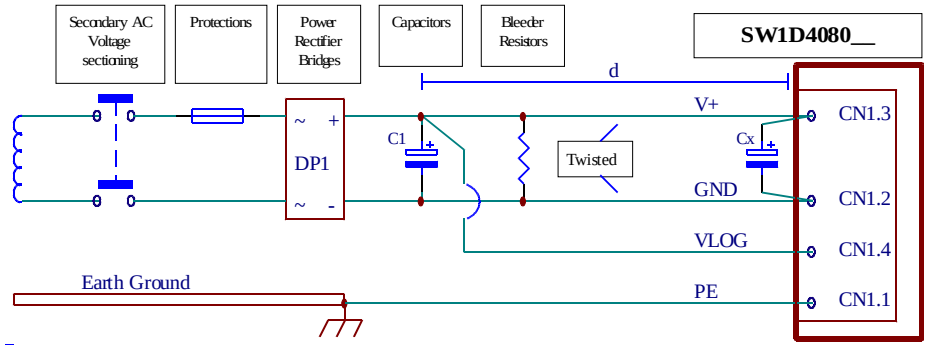
If the power supply provided by the user isn't equipped with a double isolation or reinforcement, the user is obliged to establish a security connection between GND (power supply ground) and the protective earthing (PE). A proper connection between GND and the PE, often reduces the electromagnetic interferences due to commutations of the drive and the motor.

- **PE** : Environmental Protective Earth.
- **GND** : is the reference (ground) equal to the power suppliers V+ and VLOG
- **V+** : input for the power supply of the power part (motor).
  It is possible to disable the power supply to the power part and leave the power supply to the logics enabled with control function.

N.B. : The disconnector to the secondary V+ must be positioned before the filter capacitor (C1 in the schematic) in a way that the capacity remains always connected to the terminals of the CN1 connector.
For no reason the DC power supply voltage should be sectioned; the filter capacity of the power supply needs to remain connected to the drive during the start up and shut down transients.

VLOG : input to supply the logics part of power.
Note: *VLOG shares GND with the power supply*
In case it is not necessary to supply the Logics and Power separately of power, in some version it is possible to foresee a single power supply stage to which are connected V+ and VLOG **(not for SW1D3142),** instead in other version are necessary both V+ and VLOG connections. (see paragraph 4 SW1D____ Versions)
N.B. : V+ and VLOG must be linked on the level of the filter capacity C1 (see the following figure) . For no reason a single cable should be carried from capacity C1 and executed a bridge between CN1.3-4

Connection schematic V+ and VLOG not separated:



+24 – VSS : power supply for the digital outputs and Std inputs.
For applications where in no digital outputs and Std inputs are used, this power supply section can be left out.

B0_COM_IN : reference for the digital inputs. Generally associated with VSS of the digital outputs. If they are not used, inputs of 24V, BO_COM_IN have to remain disconnected.

Main characteristics of the drive power supply

Disconnection
AC network: is a recommended safety device.

Primary
Protections: use fuses on AC bus or an equivalent security switch.

Surge on the primary circuit they protect the drive against Surges coming from
Suppressors: the primary power supply of the network.

EMC Filter: is generally necessary to satisfy the EMC compatibility requirements related to the emissions. An EMC filter is recommended in case of sensible circuits powered by an AC line. If a commercial EMC line filter is chosen, one needs to take into account the total RMS current of the powered system.

The AC EMC line filter needs to be installed following the builder's directives. Generally, the filter needs to be inserted between the principal AC line and the transformer, if the last one is near the drive or the electrical switchboard, between the transformer and the three-phase rectifier bridge in other cases, keeping the bridge near the drive and the connection between the filter and the transformer as short as possible.

Transformer: The primary circuit of the transformer needs to be dimensioned in function of the characteristics of the AC power supply line. The voltage peaks on the secondary circuit of the transformer are equal to 1.41 RMS secondary voltage. The DC power supply voltage must not exceed the Vdc power supply voltage of the drive.

DON'T use an Auto-transformer to interface with the electric network. Only a transformer guarantees the galvanic isolation necessary for electrical safety.

the power of the transformer depends on the power required from the motor: to define the characteristics of the movement under control (dimensioning of the power supply and the motor). It is possible to refer to the service support@everelettronica.it.It is also possible to use the following procedure to define approximately the characteristics of the power supply:

1. Power of the motor shaft for every axle in Watt:
   Wn =π*Nn[RPM]*Tn[Nm]/30
2. Power to the total load in Watt :
   W_S = sum of the Wn of the axles that move simultaneously;
3. power of the transformer in Watt :
   $T_W = 2 * W_S$ (efficiency = 0.5)
4. power of the transformer in VA :
   $T_{VA}=T_W$ / 0,7 (single phase) o $T_{VA}= T_W$ / 0,8 (three phase);
5. Take for the transformer a voltage drop of about 8% during the application of the load (the secondary voltage should not exceed a voltage value of 108% of the nominal value when the load is zero).
6. A simple and fast alternative method to calculate the power in VA of the transformer is: $T_{VA}(VA) = \sqrt{2}*Vdc_{BUS}*Imax_{PHASE(RMS)}$. .

Secondary disconnecting: must be positioned on the secondary AC power supply voltage (before the rectifier bridge). *For no reason the DC power supply should be disconnected the DC power; the capacity of the power supply filter has to remain connected to the drive during the start up and shut down transients.*

Secondary protections: must be present before the rectifier bridge and have to be calibrated according to the set phase current. Instead of the secondary protections there can be used an automatic safety switch.

Rectifier Bridge: a 15A rectifier bridge can be considered correct for a single axis and maximum load

Capacitor: The dimensioning of the capacitor has to take into account the functioning parameters of the installation, the type of AC line (single-phase or three-phase), the load on the shaft and the movement cycle (phase of movement and phase of motor stand still, in torque or free load).

For a ***maximal*** dimensioning, in the conditions of single-phase line, maximal current supplied by the drive at minimal voltage, the following capacitors are suitable:
- SW1D4080 => a capacitors of 6600µF .
- SW1D3142 => a capacitors of 3300µF .
- SW1D2142 => a capacitors of 2200µF .

The working voltage of the capacitor has to be evaluated considering the DC voltage peaks (Vdc_{BUS}) maintaining an adequate safety margin.

An additional capacitor *has to be provided in proximity of the drive when the cable length of the DC power supply exceeds the length of 1 mt (d>1mt).*

If a power supply of the switching type is provided, insert between the drive and the power supply a capacity able to manage the impulsive currents which the drive sends to the power supply in special working circumstances and which is required for the motion control. The purpose of this capacitor is to maintain the voltage applied to the drive within acceptable values.

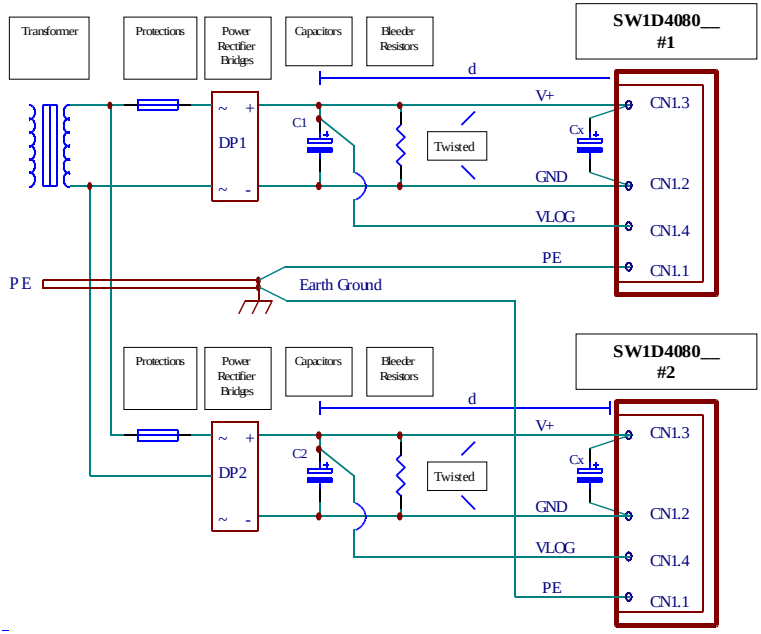
Make sure that the switching power supply is adapted to the expected capacitive load.

The dynamic performances of the motors depends on the power supply voltage: at higher tensions the performances increase.

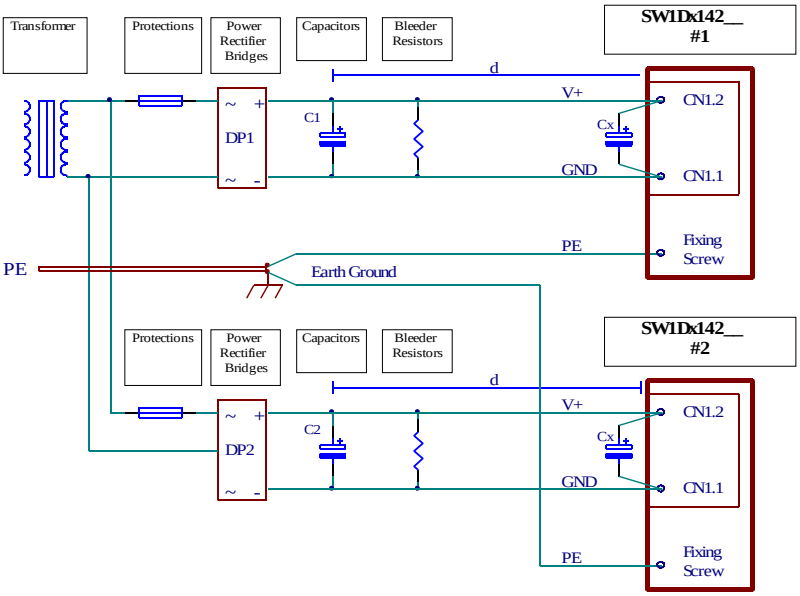
In multi-axles installations, a rectifier + capacity should be provided for every drive. Every rectifier needs to be positioned as close as possible to the concerning drive.

An additional capacitor is required near each drive with a distance of more then 1 mt from the rectifier. (d>1mt).

Power supply schematic of a SW1D4080 multi-axles installation.



Power supply schematic of a SW1Dx142 multi-axles installation. (has been left out for the simplicity of the logic supply)



3.3 Choosing the stepper motor

The SW1D____ drive has been designed to function with 2 phase stepper motors with the following characteristics:

- nominal winding current depending on the model:

		SW1D4080____			SW1Dx142____			Unit	Note
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Motor	Current			8			4.2	A_{RMS}	Configurable through software
				11.28			6	A_{PK}	

- With a connection of the Bipolar Parallel windings: the motor is powered by the drive with a winding current equal to 1.41 times the nominal unipolar current (I_{PHASE} * 1.41).

- With a connection of the Bipolar Series windings: the motor is powered by the drive with a winding current equal to 0.7 times the nominal unipolar current (I_{PHASE} * 0.70).

The choice of the stepper motor is made by considering a series of variables that depend on the application: torque required for the shaft, velocity, dimension of the motor, current, inductance etc.

The dynamic performances of the motors depend on the power supply voltage: when using a higher tension the performances increase.

3.4 Assembling of the drive

For wall mounting, refer to the figures displayed in paragraph ***2.1 Mechanical and environmental*.**
Use the M4 screws to fix the drive to a wall of the electric cabinet.

The environment in which the drive will be installed needs to be free of impurities, corrosive vapour, gases or liquids. Avoid environments where in vapour and humidity will condensate.

When installing the drive in an electrical switchboard, make sure that the opening of the air stream or the cooling system of the switchboard doesn't make the internal temperature rise above the maximum allowed working temperature.

Every local security aspect concerning the installation of the drive has to be considered a project standard for the electrical switchboard.

Assembling Guide

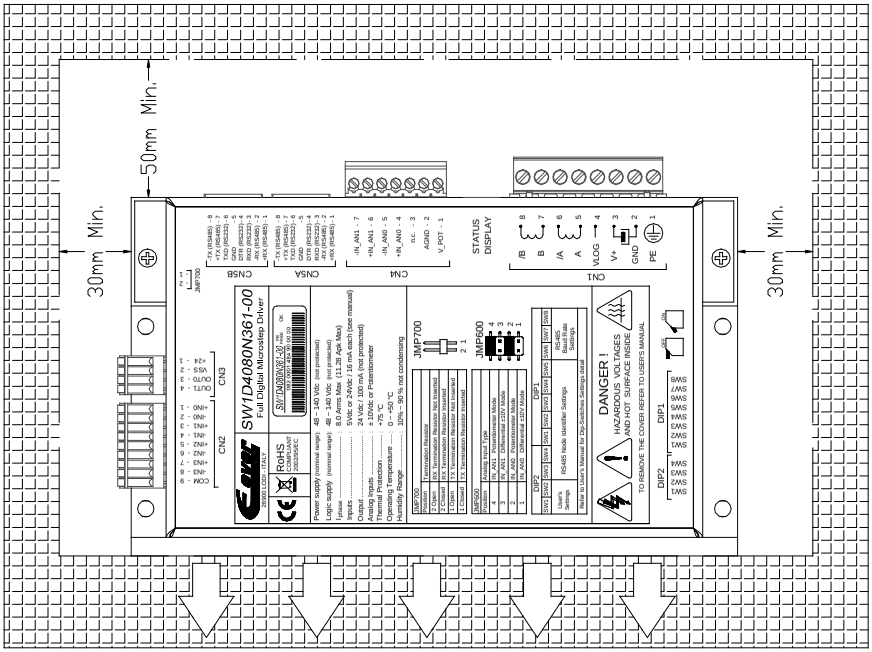
The installation has to meet at least the following requirements:

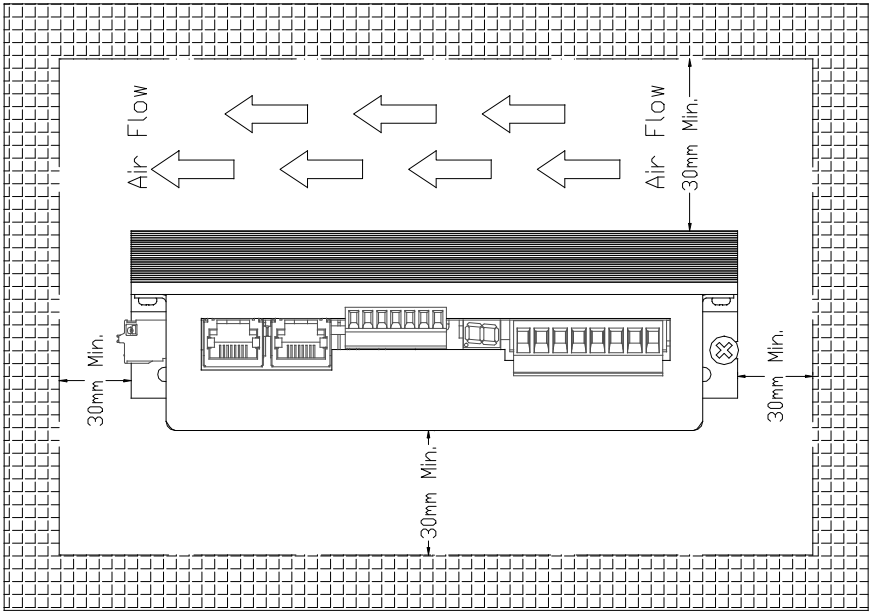
- *maintain the vertical orientation of the drive;*
- *avoid excessive vibrations or shocks;*
- *Foresee free space for the air stream above and under the drive;*
- *Respect the minimal distances indicated in the following figure;*

The cooling of the drives SW1D____ occurs mainly through radiation of the heat sink fins and secondary, by means of contact through the clamping surface of the electrical switchboard.

An insufficient heat exchange can increase the drive temperature until the threshold of the heat protection, including a system block reported by the display. In the installation project, this two dissipation channels need to be optimized.

The following figure displays a SW1D4080_61 system, but the indications are valid for all versions.





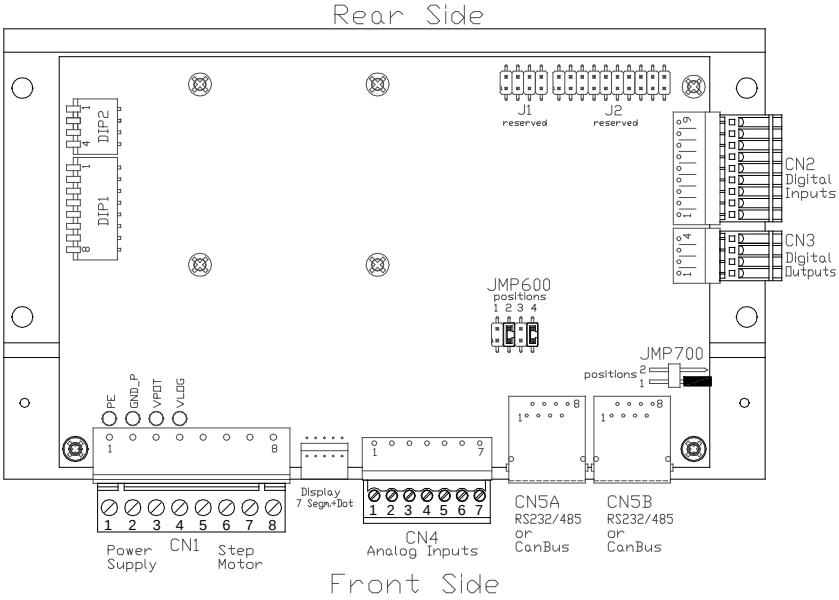
3.5 Drive connections

The following connections are present in the SW1D____ systems:

	SW1D4080__61-00	SW1D4080__B1-00	SW1D2142__61-x0	SW1D3142__61-10
CN1 Power Supply + Step Motor	✓	✓	✓	✓
CN1A Logic Supply			✓	✓
CN2 Digital Inputs Hi-Freq	✓	✓	✓	✓
CN3 Digital Outputs Hi-Freq	✓	✓	✓	✓
CN4 Analog Inputs	✓	✓	✓	✓
CN5A/B RS232/485 or CANbus	✓	✓	✓	✓
CN12 Digital Inputs Std		✓		
CN13 Digital Outputs Std		✓		
CN16 Digital Inputs Hi-Freq		✓		

3.5.1 Connectors, Dip-Switches, Jumpers, Display of SW1D4080

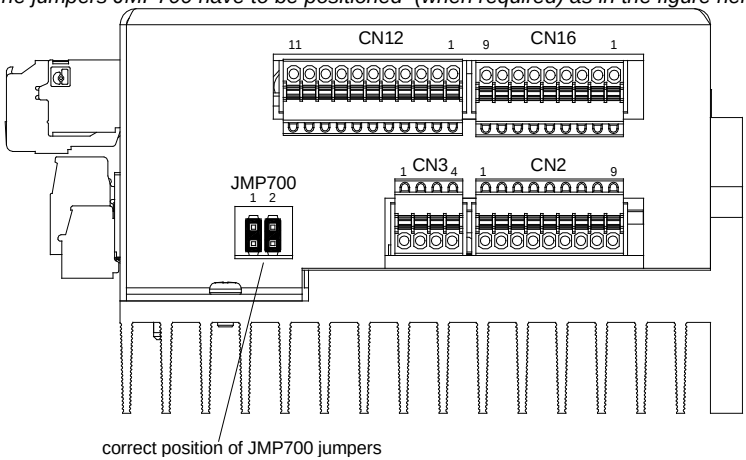
SW1D4080 : lay-out and design of the connectors, Dip-switches, jumpers and Display.



The ***SW1D4080__B1-00*** *systems have the same connectors as the* ***SW1D4080__61-00*** *systems, with the addition of the connectors CN12, CN13, CN16. Dip-switches, Jumpers and Display maintain the same position and function.*

For the position of the connectors , refer to the figure of paragraph ***3 INSTALLATION OF THE DRIVE.***

The jumpers JMP700 have to be positioned (when required) as in the figure here below.



3.5.1.1 Pin connectors SW1D4080

Connectors of the drive SW1D4080 and tables of the input and output characteristics.

CN1 : Power Supply & Motor			
8 position, pitch 5.08mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	PE	EARTH Input	Environmental earthing
2	GND	PWR Input	Negative power supply Motor and Logics
3	V+	PWR Input	Positive power supply Motor
4	VLOG	PWR Input	Positive power supply Logics
5	A	PWR Output	Phase A motor
6	A/	PWR Output	Phase A/ motor
7	B	PWR Output	Phase B motor
8	B/	PWR Output	Phase B/ motor

CN2 : Digital Inputs Hi-Freq			
9 position, pitch 2.5mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	+B0_IN0	Digital Input	Positive terminal digital input B0_IN0
2	-B0_IN0	Digital Input	Negative terminal digital input B0_IN0
3	+B0_IN1	Digital Input	Positive terminal digital input B0_IN1
4	-B0_IN1	Digital Input	Negative terminal digital input B0_IN1
5	+B0_IN2	Digital Input	Positive terminal digital input B0_IN2
6	-B0_IN2	Digital Input	Negative terminal digital input B0_IN2
7	+B0_IN3	Digital Input	Positive terminal digital input B0_IN3
8	-B0_IN3	Digital Input	Negative terminal digital input B0_IN3
9	B0_COM_IN	PWR Input	Reference common inputs (for use at $24V_{DC}$)

CN3 : Digital Outputs Hi-Freq			
4 position, pitch 2.5mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	+24V	PWR Input	Positive power supply digital outputs.
2	VSS	PWR Input	Negative reference power supply digital outputs.
3	B0_OUT0	Digital Output	Open Emitter Output (Source Current) B0_OUT0
4	B0_OUT1	Digital Output	Open Emitter Output (Source Current) B0_OUT1

CN4 : Analog Inputs			
7 position, pitch 3.81mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	V_POT	PWR Output	Positive power supply output for potentiometers.
2	AGND	PWR Output	Negative reference output for potentiometers.
3	n.c.		Not connected
4	+IN_AN0	Analog Input	Positive terminal analog input IN_AN_0
5	-IN_AN0	Analog Input	Negative terminal analog input IN_AN_0
6	+IN_AN1	Analog Input	Positive terminal analog input IN_AN_1
7	-IN_AN1	Analog Input	Negative terminal analog input IN_AN_1

CN5A - CN5B : RS232/RS485 version				
RJ45 , 8 position, PCB shielded header connector				
Pos	**CN5A (IN) RS485**	**CN5B (OUT) RS485 + RS232**	**Characteristics**	
1	+RX	+RX	Digital Input	Non-inverting input RS485 receiver
2	-RX	-RX	Digital Input	Inverting input RS485 receiver
3	n.c.	RXD	Digital Input	Input RS232 receiver
4	n.c.	DTR	Digital Output	Output Data Transmit Ready RS232
5	0V_A	0V_A	PWR Output	Reference (mass) communication interface
6	n.c.	TXD	Digital Output	Output RS232 transmitter
7	+TX	+TX	Digital Output	Non-inverting output RS485 transmitter
8	-TX	-TX	Digital Output	Inverting output RS485 transmitter

CN5A=CN5B : CanBus versions			
RJ45 , 8 position, PCB shielded header connector			
Pos	**Name**	**Characteristics**	
1	CAN_H	Digital I/O	Bus Line Dominant HIGH
2	CAN_L	Digital I/O	Bus Line Dominant LOW
3	CAN_GND	PWR Output	Signal Ground
4	n.c.		Not connected
5	n.c.		Not connected
6	n.c.		Not connected
7	CAN_GND_O	PWR Output	Optional Signal Ground
8	n.c.		Not connected

CN12 : Std Digital Inputs			
11 position, pitch 2.5mm., PCB header connector			
Pos	**Nome**	**Characteristics**	
1	B1_IN0	Digital Input	Terminal digital input B1_IN0
2	B1_IN1	Digital Input	Terminal digital input B1_IN1
3	B1_IN2	Digital Input	Terminal digital input B1_IN2
4	B1_IN3	Digital Input	Terminal digital input B1_IN3
5	B1_IN4	Digital Input	Terminal digital input B1_IN4
6	B1_IN5	Digital Input	Terminal digital input B1_IN5
7	B1_IN6	Digital Input	Terminal digital input B1_IN6
8	B1_IN7	Digital Input	Terminal digital input B1_IN7
9	B1_COM_IN	PWR Input	Reference common inputs B1_INn
10	B1_COM_IN	PWR Input	Reference common inputs B1_INn
11	B1_COM_IN	PWR Input	Reference common inputs B1_INn

CN13 : Std Digital Outputs			
12 position, pitch 2.5mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	B1_OUT0	Digital Output	Terminal digital output B1_OUT0
2	B1_OUT1	Digital Output	Terminal digital output B1_OUT1
3	B1_OUT2	Digital Output	Terminal digital output B1_OUT2
4	B1_OUT3	Digital Output	Terminal digital output B1_OUT3
5	B1_OUT4	Digital Output	Terminal digital output B1_OUT4
6	B1_OUT5	Digital Output	Terminal digital output B1_OUT5
7	B1_OUT6	Digital Output	Terminal digital output B1_OUT6
8	B1_OUT7	Digital Output	Terminal digital output B1_OUT7
9	+24V	PWR Input	Positive power supply digital outputs
10	+24V	PWR Input	Positive power supply digital outputs
11	VSS	PWR Input	Negative reference power supply digital outputs.
12	VSS	PWR Input	Negative reference power supply digital outputs.

CN16 : Digital Inputs Hi-Freq			
9 position, pitch 2.5mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	+B0_IN4	Digital Input	Positive terminal digital input B0_IN4
2	-B0_IN4	Digital Input	Negative terminal digital input B0_IN4
3	+B0_IN5	Digital Input	Positive terminal digital input B0_IN5
4	-B0_IN5	Digital Input	Negative terminal digital input B0_IN5
5	+B0_IN6	Digital Input	Positive terminal digital input B0_IN6
6	-B0_IN6	Digital Input	Negative terminal digital input B0_IN6
7	+B0_IN7	Digital Input	Positive terminal digital input B0_IN7
8	-B0_IN8	Digital Input	Negative terminal digital input B0_IN7
9	B0_COM_IN	PWR Input	Reference common inputs (for use at $24V_{DC}$)

3.5.1.2 mating connectors SW1D4080

The mating connectors are supplied with the drive SW1D4080. In case it is necessary to purchase more mating connectors, *they can be bought from third parties with the codes:*

CN1 8 position, pitch 5.08mm., plug connector
PHOENIX CONTACT p# **MSTB 2,5/8-ST-5,08** order cod.**1757077**

CN2 9 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/9-ST-2,5** order cod.**1881396**

CN3 4 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/4-ST-2,5** order cod.**1881341**

CN4 7 position, pitch 3.81mm., plug connector
PHOENIX CONTACT p# **MC1,5/7-ST-3,81** order cod.**1803620**

CN5A/B RJ45 ,8 position, plug connector
MOLEX p# **FCC 68 compliants and equivalents** order cod.**44915-0011**
order cod.**44915-0021**

CN12 11 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/11-ST-2,5** order cod.**1881419**

CN13 12 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/12-ST-2,5** order cod.**1881422**

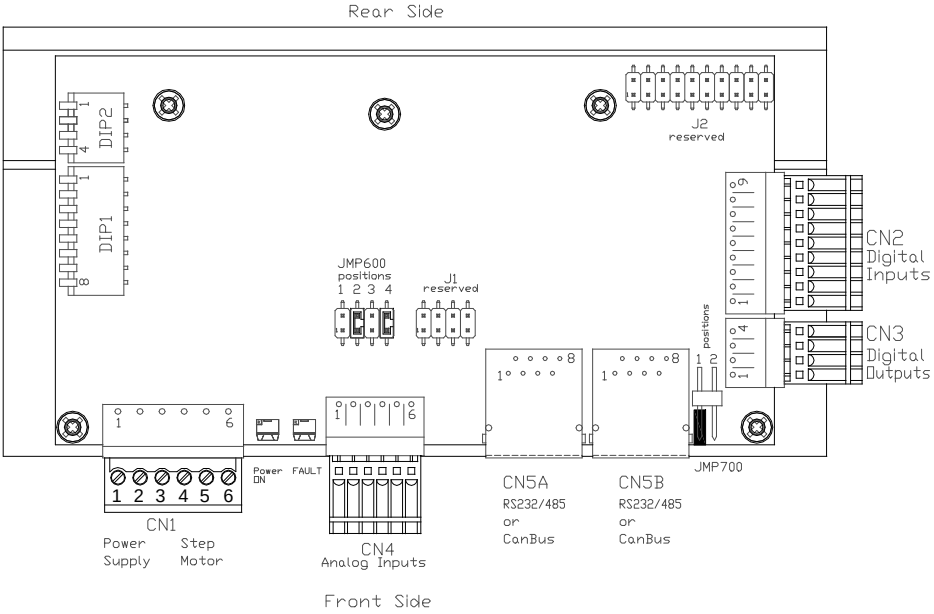
CN16 9 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/9-ST-2,5** order cod.**1881396**

3.5.1.3 Cables section SW1D4080

Power supply	Minimum	0.5mm^2 (AWG20)
	Maximum	2.5mm^2 (AWG12)
Motor output	Minimum	0.5mm^2 (AWG20)
	Maximum	2.5mm^2 (AWG12)
Digital inputs Digital outputs	Minimum	0.14mm^2 (AWG25)
	Maximum	0.5mm^2 (AWG20)
Analog inputs	Minimum	0.14mm^2 (AWG25)
	Maximum	1.5mm^2 (AWG16)

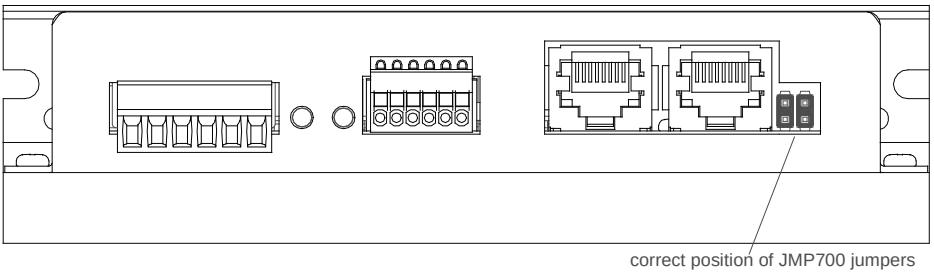
3.5.2 Connectors, Dip-Switches, Jumpers, LEDs on SW1Dx142

SW1Dx142 : Layout and design of the connectors, Dip-switches, jumpers and LED's.



For the position of the connectors, refer to the figures of paragraph: ***2.1.3 Dimensions SW1Dx142****.*

The *JMP700 jumpers have to be positioned (when required) as in the figure here below.*



3.5.2.1 Pin connectors SW1Dx142

Connectors of drive SW1D2142 and SW1D3142.

CN1 : Power Supply & Motor			
6 position, pitch 3.81mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	GND	PWR Input	Negative power supply Motor
2	V+	PWR Input	Positive power supply Motor
3	A	PWR Output	Phase A motor
4	A/	PWR Output	Phase A/ motor
5	B	PWR Output	Phase B motor
6	B/	PWR Output	Phase B/ motor

CN1A : Logic Supply			
2 position, pitch 3.81mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	GND	PWR Input	Negative logic supply
2	VLOG	PWR Input	Positive logic supply

CN2 : Digital Inputs Hi-Freq			
9 position, pitch 2.5mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	+B0_IN0	Digital Input	Positive terminal digital input B0_IN0
2	-B0_IN0	Digital Input	Negative terminal digital input B0_IN0
3	+B0_IN1	Digital Input	Positive terminal digital input B0_IN1
4	-B0_IN1	Digital Input	Negative terminal digital input B0_IN1
5	+B0_IN2	Digital Input	Positive terminal digital input B0_IN2
6	-B0_IN2	Digital Input	Negative terminal digital input B0_IN2
7	+B0_IN3	Digital Input	Positive terminal digital input B0_IN3
8	-B0_IN3	Digital Input	Negative terminal digital input B0_IN3
9	B0_COM_IN	PWR Input	Reference common inputs (for use of $24V_{DC}$)

CN3 : Digital Outputs Hi-Freq			
4 position, pitch 2.5mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	+24V	PWR Input	Positive power supply digital outputs
2	VSS	PWR Input	Negative reference power supply digital outputs
3	B0_OUT0	Digital Output	Output Open Emitter (Source Current) B0_OUT0
4	B0_OUT1	Digital Output	Output Open Emitter (Source Current) B0_OUT1

CN4 : Analog Inputs			
6 position, pitch 2.5mm., PCB header connector			
Pos	**Name**	**Characteristics**	
1	V_POT	PWR Output	Output positive power supply for potentiometers.
2	AGND	PWR Output	Output negative references for potentiometers.
3	+IN_AN0	Analog Input	Positive terminal analog input IN_AN_0
4	-IN_AN0	Analog Input	Negative terminal analog input IN_AN_0
5	+IN_AN1	Analog Input	Positive terminal analog input IN_AN_1
6	-IN_AN1	Analog Input	Positive terminal analog input IN_AN_1

CN5A - CN5B : RS232/RS485 version				
RJ45 , 8 position, PCB shielded header connector				
Pos	**CN5A (IN) RS485**	**CN5B (OUT) RS485 + RS232**	**Characteristics**	
1	+RX	+RX	Digital Input	Non-inverting input RS485 receiver
2	-RX	-RX	Digital Input	Inverting input RS485 receiver
3	n.c.	RXD	Digital Input	Input RS232 receiver
4	n.c.	DTR	Digital Output	Output Data Transmit Ready RS232
5	0V_A	0V_A	PWR Output	Reference (mass) communication interface
6	n.c.	TXD	Digital Output	Output RS232 transmitter
7	+TX	+TX	Digital Output	Non-inverting output RS485 transmitter
8	-TX	-TX	Digital Output	Inverting output RS485 transmitter

CN5A=CN5B : CanBus versions			
RJ45 , 8 position, PCB shielded header connector			
Pos	**Name**	**Characteristics**	
1	CAN_H	Digital I/O	Bus Line Dominant HIGH
2	CAN_L	Digital I/O	Bus Line Dominant LOW
3	CAN_GND	PWR Output	Signal Ground
4	n.c.		Not connected
5	n.c.		Not connected
6	n.c.		Not connected
7	CAN_GND_O	PWR Output	Optional Signal Ground
8	n.c.		Not connected

3.5.2.2 mating connectors SW1Dx142

The mating connectors are supplied with the drive SW1D2142 and SW1D3142.
In case it is necessary to purchase more mating connectors, *they can be bought from third parties with the codes:*

CN1 6 position, pitch 3.81mm., plug connector
PHOENIX CONTACT p# **MC 1,5/6-ST-3,81** order cod.**1803617**

CN1A 2 position, pitch 3.81mm., plug connector
PHOENIX CONTACT p# MC 1,5/2-ST-3,81 order cod.**1827703**

CN2 9 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/9-ST-2,5** order cod.**1881396**

CN3 4 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/4-ST-2,5** order cod.**1881341**

CN4 6 position, pitch 2.5mm., plug connector
PHOENIX CONTACT p# **FK MC0,5/6-ST-2,5** order cod.**1881367**

CN5A/B RJ45 ,8 position, plug connector
MOLEX p# **FCC 68 compliants and equivalents** order cod.**44915-0011**
order cod.**44915-0021**

3.5.2.3 Cables section SW1Dx142

Power supply	Minimum	0.5mm^2 (AWG20)
	Maximum	1.5mm^2 (AWG15)
Motor output	Minimum	0.5mm^2 (AWG20)
	Maximum	1.5mm^2 (AWG15)
Digital inputs Digital outputs	Minimum Maximum	0.14mm^2 (AWG25) 0.5mm^2 (AWG20)
Analog inputs	Minimum	0.14mm^2 (AWG25)
	Maximum	1.5mm^2 (AWG16)

3.5.3 Guideline for wiring

For a good installation of the drive:

Guideline for wiring	*Effects*
On SW1D4080 drives, connect the earthing terminal of **CN1.1** to the main terminal of Protective Earthing **(PE)** of the installation. On the drives SW1Dx142, establish the PE connection by means of a screw for mechanical fixation which has a diameter of at least **M4.**	Connection necessary Connection necessary for electrical safety. Increases the resistance for: irradiated disturbances and electrostatic flushes (ESD).
Use shielded cables for the command signals. (digital and analog inputs and communication interfaces)	Increases the resistance against disturbances and reduces the irradiated and conducted emissions.
Connect the shields of the signal cables from both ends to the ground.	Increases the resistance against disturbances and reduces the irradiated and conducted emissions. In some applications, depending on the lay-out of the machine, it can be more effective to connect the screen from one side.
The use of shielded cables is also recommended for the connection of the motor. When a shielded cable is used for the motor, connect the screen to terminal **CN 1.1** and not to the body of the motor.	Increases the resistance against disturbances and reduces the irradiated and conducted emissions.
Connect the body of the motor to the ground with a special cable. *The body of the motor and the shield of the cable have to be connected to the ground terminal with 2 separated cables.*	Necessary connection for the electric security. Reduce the conducted emissions.
Powering different drives with a single power supply, create a star connection to each drive to the terminals of the capacitor of the power supply filter (in the centre of the star).	Reduces the disturbances due to pulse current.
Maintain the connections (cables) as short as possible and avoid ground loops.	Increases the resistance against disturbances and reduces irradiated and conducted emissions.
The paths of the signal cables and controls must be separated and/or shielded from motor cables and power supply to avoid that the inductive coupling can cause incorrect operations.	Increases the resistance against disturbances.

3.6 User configurations

*Some internal parts of the SW1D____ unit can be potential sources of **electric shocks,** also for a certain period after shutting down the system, remove the CN1 connector and wait until the 7 segments display or the LED's are switched off.*

3.6.1 Dip-Switches

The SW1D_____ drives are equipped with a series of Dip-Switches with 8 contacts (DIP1) and a series of Dip-Switches with 4 contacts (DIP2).

*The functionality of the Dip-Switches depend on the Firmware installed on the drive (**A.2 FIRMWARE AND APPLICABLE NOTES**). Refer to Software Manuals (**A.1 Manuals and applicable documentation**).*

*The functionality of the Dip-Switches depend on the Firmware installed on the drive (**A.2 FIRMWARE AND APPLICABLE NOTES**). Refer to Software Manuals (**A.1 Manuals and applicable documentation**).*

At delivery, the Default configuration of the drive is as follows:
DIP1.5=ON DIP1.8 = ON other contacts DIP1 = OFF
DIP2 = all OFF

*The position of the Dip-Switches is indicated in paragraph **3.5.1 Connectors, Dip-Switches, Jumpers, Display of SW1D4080** and **3.5.2 Connectors, Dip-Switches, Jumpers, LEDs on SW1Dx142.***

NOTE: the Dip-Switches are only read by the system when it starts up. If it is necessary to change the configuration, the user needs to shut down the system, modify the configuration and start up to make the new configuration operational.

3.6.2 Jumpers

*The position of the Jumpers is indicated in paragraph **3.5.1 Connectors, Dip-Switches, Jumpers, Display of SW1D4080** and **3.5.2 Connectors, Dip-Switches, Jumpers, LEDs on SW1Dx142**.*

JMP600 : configuration of operational mode of the analog Inputs.
NOTE: to access JMP600 it's necessary to remove the cover from the drive.
NOTE: there are displayed different tables for JMP600 on SW1D4080 and SW1Dx142 because the pin-out of CN4 is different; the features are identical.

SW1D4080					
Analog Input	**JMP600 position**	**Analog Input type**	**Factory Default**	**Connections**	
IN_AN_0	1	Differential ±10V		+IN_AN0	CN4.4
				-IN_AN0	CN4.5
	2	potentiometer	✓	V_POT	CN4.1
				AGND	CN4.2
				+IN_AN0	CN4.4
IN_AN_1	3	Differential ±10V		+IN_AN1	CN4.6
				-IN_AN1	CN4.7
	4	potentiometer	✓	V_POT	CN4.1
				AGND	CN4.2
				+IN_AN1	CN4.6

SW1Dx142					
Analog Input	**JMP600 position**	**Analog Input type**	**Factory Default**	**Connections**	
IN_AN_0	1	Differential ±10V		+IN_AN0	CN4.3
				-IN_AN0	CN4.4
	2	potentiometer	✓	V_POT	CN4.1
				AGND	CN4.2
				+IN_AN0	CN4.3
IN_AN_1	3	Differential ±10V		+IN_AN1	CN4.5
				-IN_AN1	CN4.6
	4	potentiometer	✓	V_POT	CN4.1
				AGND	CN4.2
				+IN_AN1	CN4.5

Attention: the jumper JMP600 must not be closed in position 1 and 2 and position 3 and 4 at the same time. All other combinations are allowed.

JMP700 : insertion termination resistances on the communication interfaces. JMP700 is accessible from the outside.

JMP700 position	RS232/RS485 Versions	CanBus Versions	Factory Default
1 free	Resistance 120Ω on the transmission line RS485 ***not inserted***	Not connected	
1 inserted	Resistance 120Ω on the transmission line RS485 ***inserted***	Not connected	✓
2 free	Resistance 120Ω on the receiving line RS485 ***not inserted***	Resistance 120Ω on CanBus ***not inserted***	
2 inserted	Resistance 120Ω on the receiving line RS485 ***inserted***	Resistance 120Ω on CanBus ***inserted***	✓

Attention : with a RS485 Half-Duplex connection, insert only 1 jumper indifferently in position 1 or 2.

3.6.2.1 Opening the cover to modify jumpers

All operation of changes in jumpers configuration must be done by qualified personnel.

To proceed with the removal of the cover of the drive and the next change of the jumper configuration, you must follow the following guidelines :

- *make sure that there are no voltage applied to the drive;*
- *disconnect all connectors from the drive;*
- *unscrew the screws;*
- *lift the cover accurately;*
- *unscrew the 4 fixing screws of the board;*
- *lift the board carefully;*
- *change the jumpers configuration paying attention to not damage the connectors;*

For closing, follow the indications in revers order.

3.7 First start up procedure

Check all connections: power supply, motor and control logic.

- Make sure that all settings are correct for the application.
- Make sure that the characteristics of the DC power supply are adapted to the drive.
- If possible, remove the load from the motor shaft to avoid that incorrect movements cause damage.
- Supply of power and make sure that the display is switched on.
- If the display remains switched off, shut the system immediately down and verify if all connections are made correctly.
- Enable the current to the motor and verify if it is in torque.
- Execute a movement of some steps and verify if the rotation direction is the desired one.

If the rotation direction of the motor shaft has to be reversed, after having removed the power supply, reverse the connection of only one of the motor phases, for example A with A/

- Remove the power supply, fix the motor to the load and check the full functionality.

3.8 Operational statuses and their signals

The systems SW1D4080 and SW1Dx142 have different signalling systems of the operational statuses. The following paragraphs describe the different modes.

3.8.1 Operational statuses and signals of SW1D4080

Status signalling The working conditions of drive SW1D4080 are displayed by means of the 7 segments display.
The following statuses can be displayed:

"b." Execution of the Boot program: as soon as it is powered it indicates that the boot program has been executed correctly.

"I." Initialization: the drive executes the start-up procedure (a few seconds after the start-up procedure has begun).

"S." Firmware execution statuses:

- "S." Correct functioning;

- "S."+"G." Alternated characters:
Attention: $I_{nominal}$ not allocated
Limits : see the limits in the currents table.
Action: configure the motor current;
Restart: automatically after the configuration of the current;

- "S."+"8." Alternated characters:
Attention: Voltage of the DC bus near the maximal value (1);
Limits: nnnVdc ≤ Vbus ≤ nnnVdc;
Action: correct the DC power supply voltage to guarantee nnnVdc ≤ Vbus ≤ nnnVdc;
Restart: automatically if nnnVdc ≤ Vbus ≤ nnnVdc;
Note : nnn depends on the version;

- “S.”+“3.” Alternated characters:
Attention: drive temperature is near to the maximum value;
Limits: 70°C ≤ Tsink ≤ 76°C
Action: establish the cooling of the drive;
Restart: automatically if Tsink ≤ 70°C;

- “S.” flashing: Enable OFF, current zero;

“C.” Missing Operating System: no software application stored on drive;

“U.” Firmware update: Updating of new software in progress.

“P.” Protection statuses: the drive has detected a protection;

- “P.”+“0.“ alternated characters:
Protection: open motor phases;
Limits: not significant;
Action: check the connection of the motor;
Restart: shut down to exit the memorized protection status;

- “P.”+“1.”alternated characters:
Alarm: over/under voltage (1);
Limits: DC bus<nnnVdc and DC bus>nnnVdc;
Note : nnn depends on the version:

- “P.”+“2.”alternated characters:
Protection: over current on the motor output;
Limits: ;
Action: check the cable and the motor on short circuits between the connection wires or to the motor body. Verify that the motor cable hasn't been disconnected from the active current in the phases.

Restart: shut down to exit the memorized protection status or activate the RESET input;

- “P.”+“3.” alternated characters:
Protection: over temperature of the drive;
Limits: heat sink temperature >75°C;
Action: establish the cooling of the drive;
Restart: automatically when the drive temperature is ≤ 75°C;

“E.” error: an internal Software Error occurred in the drive;

- “E.”+ “0.” alternated characters:
Error: Security intervention of watchdog;
Action: shut down to exit the memorized protection status or activate the RESET input;

- “E.”+ “1.” alternated characters:
Error: Internal Software Error;
Action: contact EVER;

- “E.”+ “2.” alternated characters:

Error: missing calibration values;
Action: contact EVER;

- "F."+ "4." alternated characters:
Error: management EEPROM;
Action: contact EVER;

The following start up sequences are displayed by the 7 segments display:
"8." → "8." → "5." : correct start up sequence.
 → "5." "+"5." "1." "3." "6.": alarm condition.

"8." → "8." → "A."+ "0." "1." "2." "3.": start up followed by a protection intervention

"8." → "8." → "F."+"0." "1." "2." "4.": start up as a result of an internal software error.

"8." → "2." : start up with missing operating system.

(1) Note : the voltage value is measured on base of the power supply voltage for the motor V+. Any voltages out of Range of VLOG and/or 24 VDC are not detected.

The details of the type FAULT are send as an error message through the communication interface.
Consult the software manual for more information ***(A.1 Manuals and applicable documentation).***

3.8.2 Operational statuses and signals SW1Dx142

Status signalling The working conditions of the drive SW1Dx142 are displayed by means of the green FAULT LED light..
The statuses which can be visualized are:

- Slow flashing (0.5 Hz) => normal functioning ;
- Quick flashing (10Hz) => FAULT condition;
- Slow flashing (10Hz) alternating Quick flashing (5 Hz) => Warning condition

The details about the FAULT type are sent as an error message through the communication interface.

Consult the software manual for more information

3.9 Analysis of not reported malfunctions

When one of the situations occur as mentioned here below, the drive doesn't function correctly and some error codes will not be shown on the display or by the LED's.

DEFECT	The external fuse to the drive burns.
CAUSE	It may be caused as a result of a wrong connection to the power supply.
ACTION	Correct the connection and substitute the fuse. Use exclusively fuses with characteristics described in paragraph ***3.2 Power supply of the system***.
DEFECT	Noisy motor movement with vibrations.
CAUSE	Can be caused due to a state of resonance.
ACTION	Increase the step angle resolution and/or change the velocity of the motor to exit from the resonance region.
DEFECT	At high speed, the motor hasn't sufficient torque
CAUSE	May be caused due to the automatic limitation of the motor currents.
ACTION	Try to reduce the fractionation of the step angle, increase the current in the motor (always remaining into the specifications of the drive and the motor), increase the power supply voltage, change the connection of the motor from “series” to “parallel”.

In case it's not possible to solve the problem, and thinking that the system isn't damaged, contact the EVER technical support dpt providing the following information:

- The system version (SW1D___) and serial number printed on the system label.
- The complete problem description and the conditions where in the problem occurs.
- The description of the drive configuration in the application (Current, step type, functioning type, etc.)
- The value of the power supply voltage and the characteristics (single phase, three phase,ripple....).
- The description of the power feeding and the control signals cabling and the presence of other components in the installation.
- The description of the application (motor movements, loads, velocity, etc.).

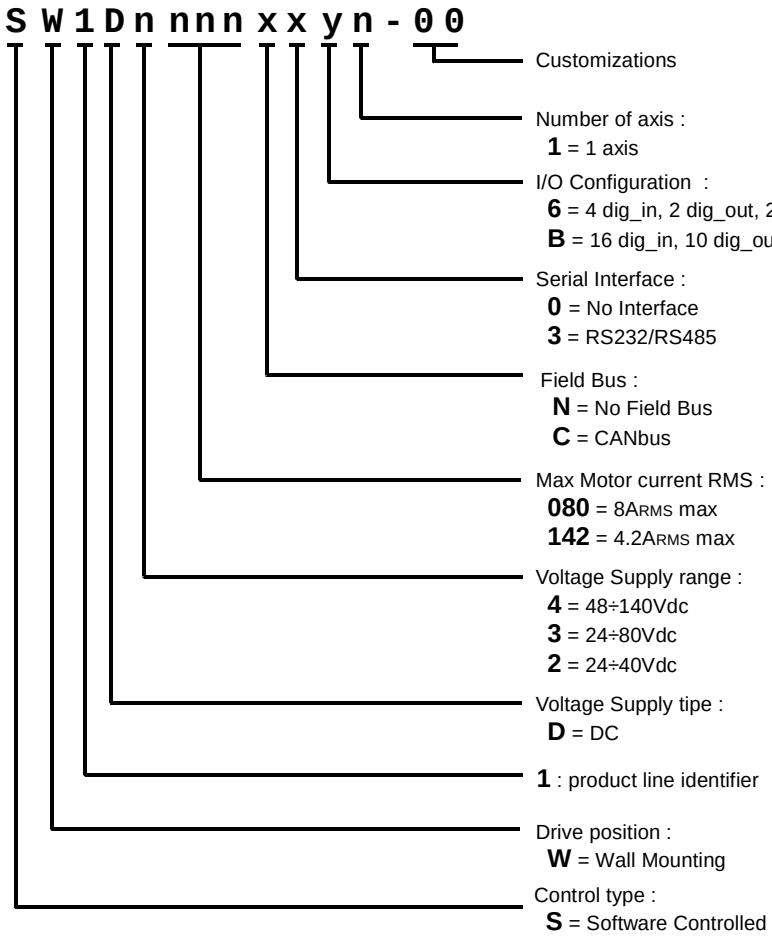
Return procedure To return a damaged drive to EVER please fill the RMA form available at www.everelettronica.it or through this direct link :

http://www.support-everelettronica.com/en/rma.asp

An email including the RMA number and the return procedure will be send by EVER to the customer.

4 SW1D____ Versions

The code of the SW1D____ system is composed as follows:



Example :

1. SW1D4080C0B1-00 : wall mounting drive, power supply 48÷140Vdc, motor current till $8A_{RMS}$, CANbus, no serial interface, 4+4 digital IN Hi-Freq, 2 analog IN, 2 digital out Hi-Freq, 8 Digital Input Std, 8 Digital Output Std, no customization.

2. SW1D2142N361-00 : wall mounting drive, power supply 24÷40Vdc, motor current till $4.2A_{RMS}$, no CANbus, 1 serial interface RS232/RS485, 4 digital Hi-Freq IN, 2 analog IN, 2 digital out Hi-Freq, no customization.

The following table presents the characteristics of the available hardware versions.

	SW1D4080C061-00	***SW1D4080N361-00***	***SW1D4080C0B1-00***	***SW1D4080N3B1-00***
Drive type	Base	Base	Base + expansion	Base + expansion
DC Power supply Motor (Nominal)	48 ÷ 140Vdc	48 ÷ 140Vdc	48 ÷ 140Vdc	48 ÷ 140Vdc
DC Power supply Logics (Nominal)	24 ÷ 140Vdc **(required)**	24 ÷ 140Vdc **(required)**	24 ÷ 140Vdc **(required)**	24 ÷ 140Vdc **(required)**
Motor current	Max $8A_{RMS}$ (max $11.28A_{PK}$)	Max $8A_{RMS}$ (max $11.28A_{PK}$)	Max $8A_{RMS}$ (max $11.28A_{PK}$)	Max $8A_{RMS}$ (max $11.28A_{PK}$)
Hi-Freq Digital Inputs (1)	4 optoisolated	4 optoisolated	4+4 optoisolated	4+4 optoisolated
Std Digital Inputs (2)	0	0	8 optoisolated	8 optoisolated
Analog Inputs	2	2	2	2
Hi-Freq Digital Outputs (3)	2 optoisolated	2 optoisolated	2 optoisolated	2 optoisolated
Std Digital Outputs Std (4)	0	0	8 optoisolated	8 optoisolated
RS232/RS485 Interface	No	Yes	No	Yes
CANbus	Yes	No	Yes	No
EEprom	Yes	Yes	Yes	Yes
User configurations	8+4 Dip-Switches	8+4 Dip-Switches	8+4 Dip-Switches	8+4 Dip-Switches
Display	7 segm. + Dot Display	7 segm. + Dot Display	7 segm. + Dot Display	7 segm. + Dot Display
Protection degree	IP20	IP20	IP20	IP20
Dimensions	165 x 97,5 x 54,3 mm (L x D x H)	165 x 97,5 x 54,3 mm (L x D x H)	165 x 97.5 x 62.3 mm (L x D x H)	165 x 97.5 x 62.3 mm (L x D x H)
Weigth	680gr	680gr	750gr	750gr
Working temperature	5°C ÷ 40°C	5°C ÷ 40°C	5°C ÷ 40°C	5°C ÷ 40°C

Note : (1) = Hi-Freq digital inputs 5V / 24V 200KHz (real-time inputs)
(2) = Std digital statuses inputs 5V / 24V 250Hz (statuses inputs)
(3) = Hi-Freq 24V 40KHz
(4) = Std digital statuses outputs 24V 250Hz (statuses outputs)

	SW1D2142C061-00	SW1D2142N361-00	SW1D2142C061-10	SW1D2142N361-10	SW1D3142C061-10	SW1D3142N361-10
Drive type	Base	Base	Base	Base	Base	Base
DC Power supply Motor (Nominal)	24 ÷ 40Vdc	24 ÷ 40Vdc	24 ÷ 40Vdc	24 ÷ 40Vdc	24 ÷ 80Vdc	2 4 ÷ 80Vdc
DC Power supply Logics (Nominal)	24 ÷ 40Vdc	24 ÷ 40Vdc	24 ÷ 40Vdc **(required)**	24 ÷ 40Vdc **(required)**	24 ÷ 40Vdc **(required)**	24 ÷ 40Vdc **(required)**
Motor current	Max 4.2A_{RMS} (max 6A_{PK})	Max 4.2A_{RMS} (max 6A_{PK})	Max 4.2A_{RMS} (max 6A_{PK})	Max 4.2A_{RMS} (max 6A_{PK})	Max 4.2A_{RMS} (max 6A_{PK})	Max 4.2A_{RMS} (max 6A_{PK})
Hi-Freq Digital Inputs (1)	4 optoisolated	4 optoisolated	4 optoisolated	4 optoisolated	4 optoisolated	4 optoisolated
Std Digital Inputs (2)	0	0	0	0	0	0
Analog Inputs	2	2	2	2	2	2
Hi-Freq Digital Outputs (3)	2 optoisolated	2 optoisolated	2 optoisolated	2 optoisolated	2 optoisolated	2 optoisolated
Std Digital Outputs Std (4)	0	0	0	0	0	0
RS232/RS485 Interface	No	Yes	No	Yes	No	Yes
CANbus	Yes	No	Yes	No	Yes	No
EEprom	Yes	Yes	Yes	Yes	Yes	Yes
User configurations	8+4 Dip-Switches	8+4 Dip-Switches	8+4 Dip-Switches	8+4 Dip-Switches	8+4 Dip-Switches	8+4 Dip-Switches
Display	Led “POWER ON” Led “FAULT”	Led “POWER ON” Led “FAULT”	Led “POWER ON” Led “FAULT”	Led “POWER ON” Led “FAULT”	Led “POWER ON” Led “FAULT”	Led “POWER ON” Led “FAULT”
Protection degree	IP20	IP20	IP20	IP20	IP20	IP20
Dimensions	142 x 74 x 37 mm (L x D x H)	142 x 74 x 37 mm (L x D x H)	142 x 74 x 37 mm (L x D x H)	142 x 74 x 37 mm (L x D x H)	142 x 74 x 37 mm (L x D x H)	142 x 74 x 37 mm (L x D x H)
Weigth	500gr	500gr	500gr	500gr	500gr	500gr
Working temperature	5°C ÷ 40°C	5°C ÷ 40°C	5°C ÷ 40°C	5°C ÷ 40°C	5°C ÷ 40°C	5 °C ÷ 40°C

Note : (1) = Hi-Freq digital inputs 5V / 24V 200KHz (real-time inputs)
(2) = Std digital statuses inputs 5V / 24V 250Hz (statuses inputs)
(3) = Hi-Freq 24V 40KHz
(4) = Std digital statuses outputs 24V 250Hz (statuses outputs)

APPENDICES

A.1 Manuals and applicable documentation

Hardware Manuals SW1 :

Manual code	*Name file (.pdf)*	*Manual description*
MAN.HISW1D____	Manual_SW1D____IT	SW1D____ Manual for Installation, Use and Maintenance.

Software Manuals SW1 **Standard MODBUS® (C0400)** :

Manual code	*Name file (.pdf)*	*Manual description*
MAN.SESW1MODBUS	Manual_SW1_Modbus_EN	MODBUS® RTU Protocol Specification for SW1 (Slim Line Series Drives)

Software Manuals SW1 **Standard CANopen (C0300)** :

Manual code	*Name file (.pdf)*	*Manual description*
MAN.SESW1CANOPEN	Manual_SW1_CANopen_EN	CANopen Protocol Specification for SW1(Slim Line Series Drives)

Software manuals SW1 **eePLC® (C0490)** :

Manual code	*Name file (.pdf)*	*Manual description*
MAN.SESW1EEPLC	Manual_SW1_eePLC_Studio_EN	eePLC® Studio Software Manual for SW1 (Slim Line Series Drives)
MAN.SESW1LABRTM	Manual_SW1_Labelling_Realtime_Module_EN	Labelling Realtime Module Manual for eePLC®

A.2 FIRMWARE AND APPLICABLE NOTES

In this appendix are presented the available firmware versions and some practical examples of possible applications of the SW1D____ systems.

The differences between the SW1D____ systems are present in the hardware and software configurations. On all hardware configurations it is possible to obtain different functionalities on base of the firmware programmed on the system. The principal firmware families can be summarized:

Hardware	***Firmware***	***Description***	***Note***
SW1D____	***C0300***	CANbus Slave	The Stepper Drive Module with CANbus communication protocol (CANopen) can be integrated as a slave in a system where in a master controller is present.
SW1D____	***C0400***	MODBUS® Slave	Stepper Drive Module with communication protocol MODBUS ® RTU (serial interfaces RS232 and RS485) can be integrated as a slave in a system where in a master controller is present.
SW1D____	***C0490***	eePLC®	Stepper Drive Module with communication protocol MODBUS ® RTU (serial interfaces RS232 and RS485) can be integrated as a slave in a system where in a master controller is present.

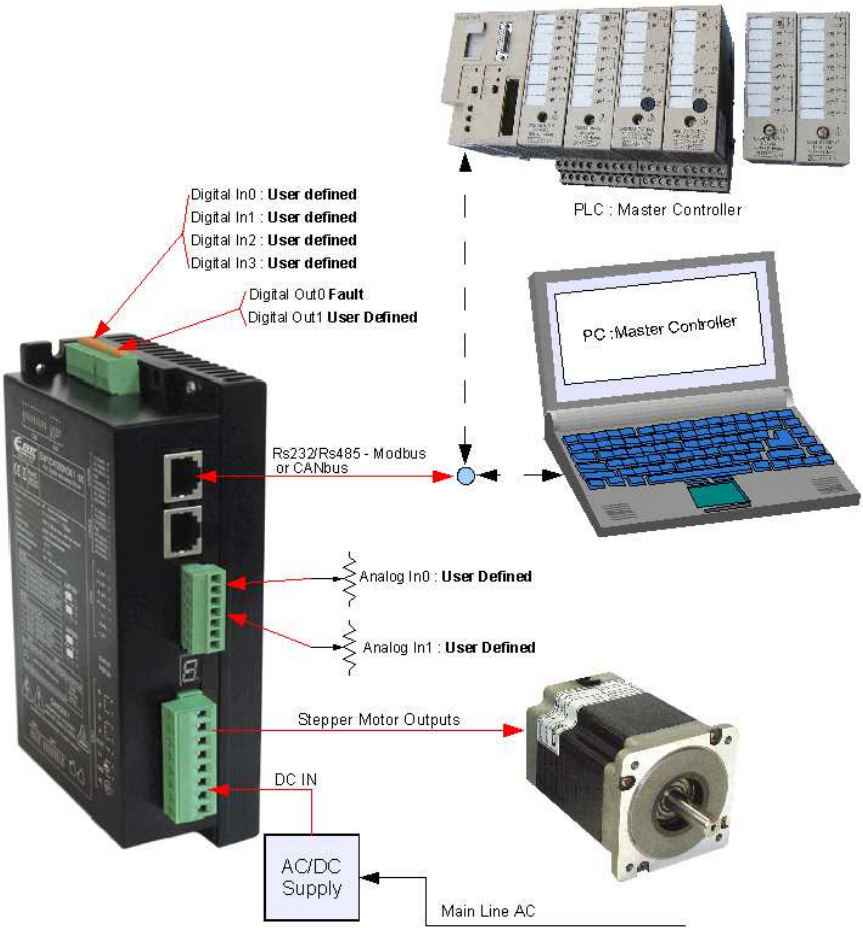
For the operational details, refer to the related software manuals for each version.

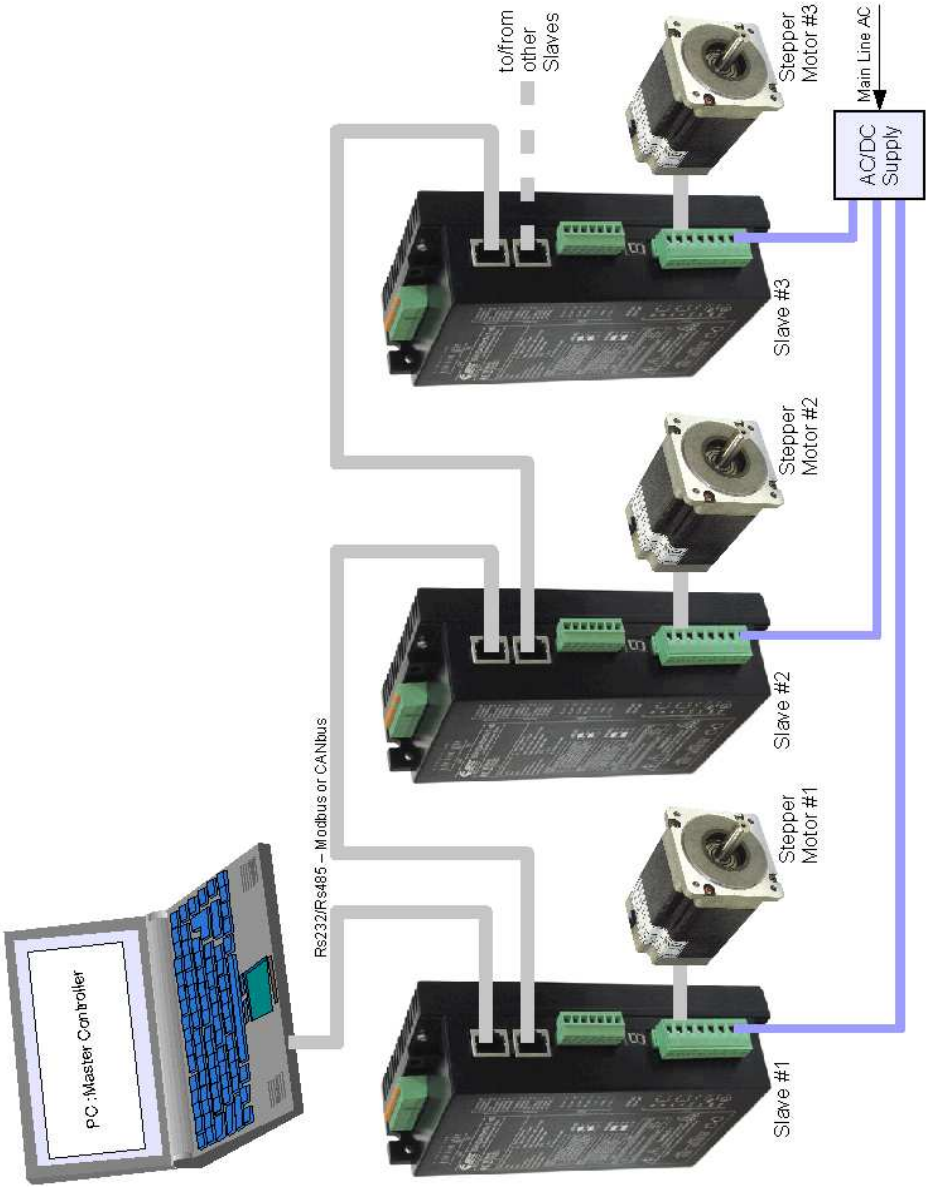
Follow examples of applications.
The images are purely indicative and might display drives which are not described in this manual.

A.2.1 MODBUS® and CANbus Slave

The software configurations CANbus C0300 and MODBUS® Slave C0400 differ because of the different type of implemented communication bus and the relative software protocol.
All other characteristics are identical.
The “Slave” software configurations are developed to allow the controlling of the drive by a “Master” which normally is represented by a PC or PLC.
All functionalities of the drive (parameters motor, digital inputs/outputs, motor inputs etc.) are parameterized through control strings and commands send by the Master.
This type of software configuration is in particular suitable for applications with a machine master and for multi-axles systems.

For details about the application, consult the relative software manuals.
C0300 : CANbus (CANOpen)
C0400 : RS232/RS485 (MODBUS® RTU)




PC :Master Controller
Rs232/Rs485 – Modbus or CANbus
Slave #1
Slave #2
Slave #3
Stepper Motor #1
Stepper Motor #2
Stepper Motor #3
to/from other Slaves
Main Line AC
AC/DC Supply

A.2.2 eePLC®

The eePLC® technology patented by EVER, integrates the following functionalities in a unique device:

- *Motion Controller*
- *PLC*
- *Real-time modules dedicated to specific applications*

The SW1D____ *eePLC® (C0*490) systems allow to realize a stand-alone motion control device able to manage autonomously all necessary processes in a machine without the need for a (PLC or PC) supervising controller.

eePLC® Studio is a programming environment based on MS Windows® which allows users to develop and personalize autonomously in an easy way their motion control application. *eePLC® Studio* supplies an extremely simple interface to compile, execute, test and debug with one single software tool.

The *eePLC® Studio* environment *is composed of:*

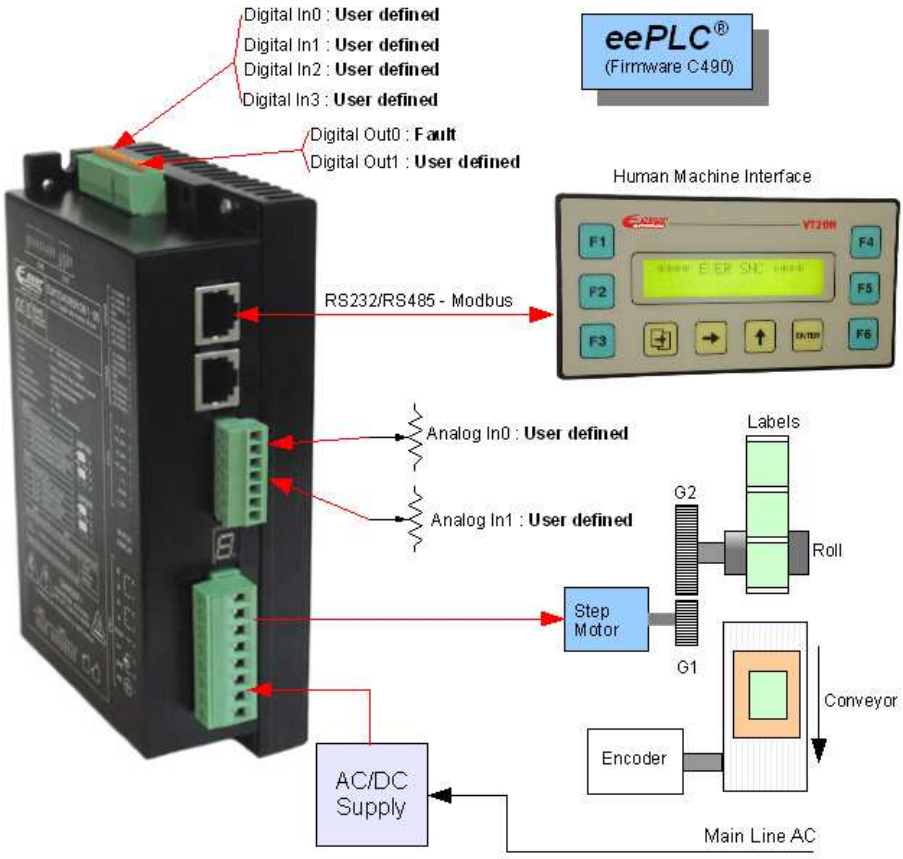
- *user interface for a quick configuration of the specific application*
- *programming environment for Microsoft Windows®*
- *programming cable*

The parameters of the applications are inserted by answering a series of questions in specific dialog boxes: drive type, axles, programming of digital inputs and outputs, programming of analog inputs, configuration of motion criteria, criteria for the motor performances.

For each of these aspects a specific dialog box appears with a special on-line help menu.
The programming can be done quickly without the possibility to make syntax or compile errors.
The communication interface can be used, besides for the programming of the functional parameters, to realize a control panel and to display data available for the user.

In the following 2 figures, the typical LABELLING application is shown in the versions with PC connection and with a HMI.

The figure presents a hypothetical stand-alone application based on the eePLC technology.

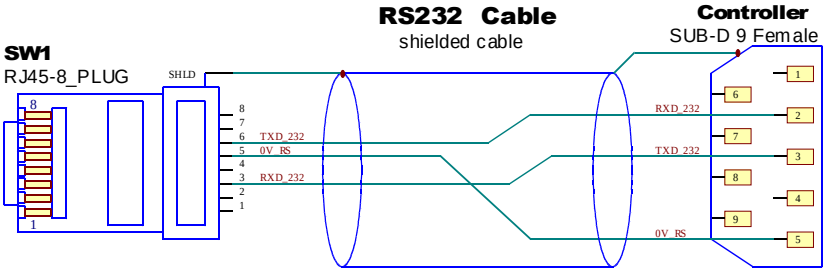


For the details about the application, consult the eePLC® software manual.

A.3 Cables and adapters

A.3.1 Cable RS232 point-to-point SW1-Controller

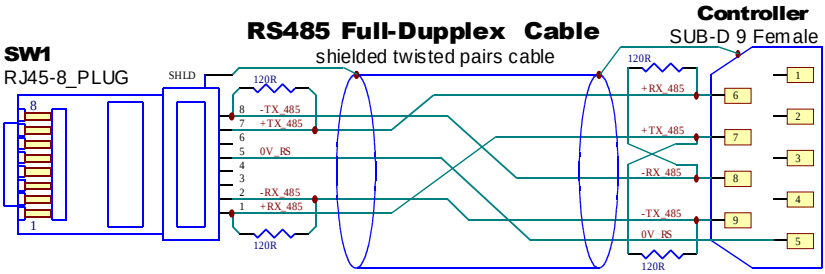
Description: cable for the direct point-to-point connection through RS232 of a SW1 drive to a controller (PC, PLC, GWC etc.) provided with a SUBD-9M connector with a compatible pin-out scheme.



SW1 RJ45-8 Plug pin#	Controller SUB-D 9 F pin#
1	
2	
3	3
4	
5	5
6	2
7	
8	
Shield	Shell

A.3.2 Cable RS485 Full-Duplex point-to-point SW1-Controller

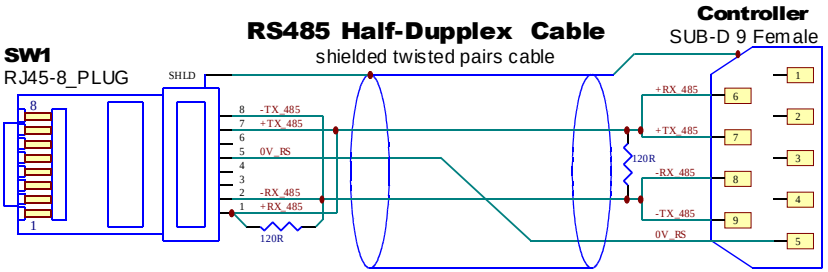
Description: cable for the direct point-to-point connection through RS485 Full-Duplex (4 wires + GND) of a SW1 drive to a controller (PC, PLC, GWC etc.) provided with a SUBD-9M connector with a compatible pin-out scheme.



SW1 RJ45-8 Plug pin#	Controller SUB-D 9 F pin#
1	7
2	9
3	
4	
5	5
6	
7	6
8	8
Shield	Shell

A.3.3 Cable RS485 Half-Duplex point-to-point SW1-Controller

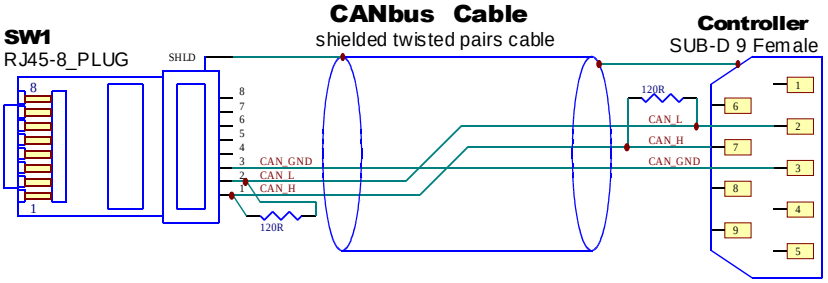
Description : cable for the direct point-to-point connection through RS485 Half-Duplex (2 wires + GND) of a SW1 drive to a controller (PC, PLC, GWC etc.) provided with a SUBD-9M connector with a compatible pin-out scheme.



SW1 RJ45-8 Plug pin#	Controller SUB-D 9 F pin#
1 - 7	6 - 7
2 - 8	8 - 9
3	
4	
5	5
6	
7 - 1	
8 - 2	
Shield	Shell

A.3.4 Cable CANbus point-to-point SW1-Controller

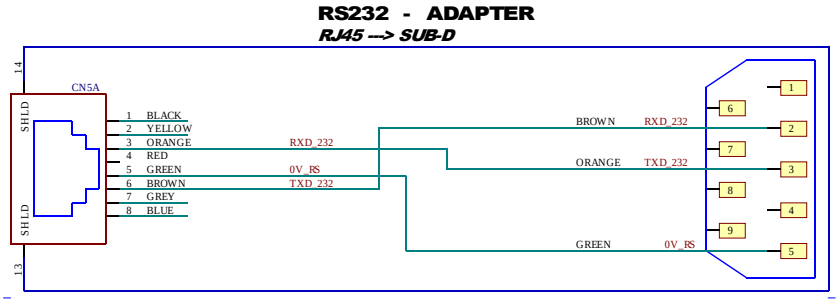
Description: cable for the direct point-to-point connection through CANbus (CANOpen) of a SW1 drive to a controller (PC, PLC, GWC etc.) provided with a SUBD-9M connector with a compatible pin-out scheme.



SW1 RJ45-8 Plug pin#	Controller SUB-D 9 F pin#
1	7
2	2
3	3
4	
5	
6	
7	
8	
Shield	Shell

A.3.5 Adapter RS232 SW1-Controller

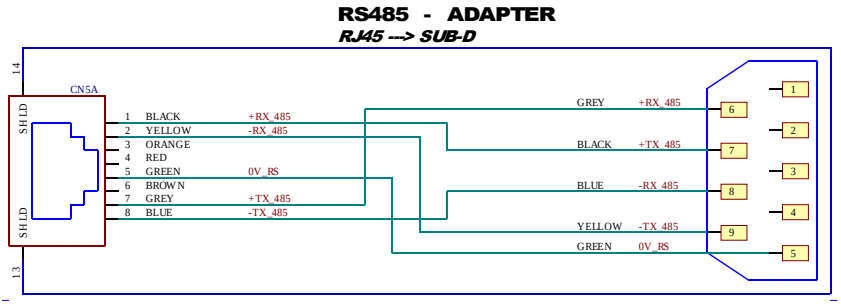
Description : adapter to use cables such as Ethernet Standard 8 wires, for the connection through RS232 of a SW1 drive to a controller (PC, PLC, GWC etc.) provided with a SUBD-9M connector with a compatible pin-out scheme.
The adaptor has to be positioned on the Controller side. The colour of the cables is related to the commercial adapter:
brand *MH CONNECTORS* type *MHDA9-SMJ8-K.*



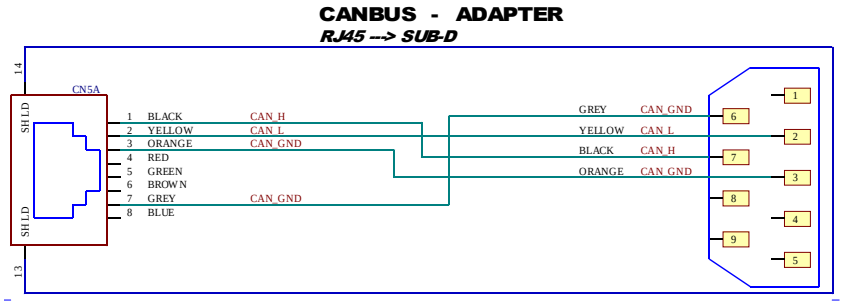
A.3.6 Adapter RS485 SW1-Controller

Description : adaptor to use cables of the type Ethernet Standard 8 wires, for the connection through RS485 Full-duplex (4 wires + GND) of a SW1 drive to a controller (PC, PLC, GWC etc.) foreseen of SUBD-9M connector with compatible pin-out scheme.

The adaptor has to be placed on the side of the Controller.
The colour of the cables is referred to the commercial adaptor:
brand MH CONNECTORS type *MHDA9-SMJ8-K.*



A.3.7 Adapter CANbus SW1-Controller

Description : adapter to use cables of the type Ethernet Standard 8 wires, for the connection through CANbus (CANopen) of a SW1 drive to a controller (PC, PLC, GWC etc.) foreseen of a SUBD-9M connector with a pin-out compatible scheme.

The adaptor has to be placed on the side of the Controller.
The colour of the cables is referred to the commercial adaptor:
brand MH CONNECTORS type *MHDA9-SMJ8-K*.